REPORT AND ESTIMATES

FOR EXTENSION OF THE

CARWAR LINE

FROM GUDDUK TO BELLARY

ON THE NARROW GAUGE.

AUGUST 1873.

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on 10 January, 2019

To

THE CONSULTING ENGINEER FOR RAILWAYS.

SIR,

I have the honour to forward you the accompanying Report and Estimate for the extension of the Carwar Line, with narrow gauge from Gudduk to Bellary.

I have the honour to remain,

Sir,

Your most obedient servant,

C. J. SHAW, Chief Engineer,

Carwar State Railway Survey.

August 1873.

REPORT ON PROPOSED EXTENSION OF THE CARWAR LINE FROM GUDDUK TO BELLARY.

The Bellary extension starts from the Carwar and Gudduk line at 143 Ms., 40Chs., hard by the road that connects Gudduk and Betgaree; and proceeds for about 9 miles nearly due east as far as Hurlapoor. At Hurlapoor it takes some southing and runs into Copal—mileage 35 Ms., 20 Chs.—entering the Nizam's dominions at 15Ms., 26 Chs., about 3 miles to the west of a village called Bunnikopoo. From Copal, for about 6 miles, the line then keeps due east, so as to avoid a range of hills that trends to the Toongabuddra, and having flanked these hills, turns south east to Hooligee on the Toongabuddra, which is the boundary of H. H. Nizam's dominions. The line thus lies for 27 miles in foreign territory. From the Toongabuddra the direction generally continues south-east, and passing through Chitwaddy, a rich and populous village, whose wealth consists in the possession of a belt of irrigated land on the Toongabuddra, leaves Hospett, about 1 mile to the south, and passing by the Anuntstain temple, follows the Bellary road through a valley, as far as the Kooreekompi river. The line then leaves the road, winds by the foot of the Darojee tank, and, running north for about two miles, crosses the Bellary and Darojee road; and, again taking a south-easterly direction, passes by Timapoor and Veerapoor, and, keeping between two small granite hills to the north of Bellary, entirely misses the cantonment, and makes a junction with the Madras line at the Bellary station. The question of the point of junction with the Madras line is considered in another portion of this report.

The route abovementioned is nearly identical with that described in Colonel Hancock's memorandum.

The distance thus traversed is 91¼ miles, and the line lies within the territories of three separate Governments; for, passing out of the Bombay Presidency, it enters the Nizam's dominions, and, after crossing the Toongabuddra, falls within the range of the Madras Government. The natural peculiarities of the country are few—the most noticeable being the islets of variously coloured granite rocks that crop up from the surrounding plain, and the fringe of date palms bordering the streams. On these plains the eye is seldom relieved by the sight of the evergreen mango or tamarind grove, but a few babool trees and milkbushes break the line of the horizon.

The character of the cultivation, and of the crops, of course, depends on the nature of the soil. For the first four miles the soil is red and gravelly, and produces little but jowaree; for the next twenty-two, the country is a rich black soil, varying from 2′ 6″ to 5′ 0″ in depth, growing cotton, flax, wheat, pulses, and oilseeds, under a rotation of crops. From thence to the Toongabuddra, for 23 miles (with the exception of a width of ½ a mile on the banks of the Toongabuddra, irrigated from the river), the soil is principally a red sterile moorum, growing with difficulty a little jowaree, and a few castor-oil plants, but with occasional strips of black soil in the bottom near the rivers.

On the Madras side of the Toongabuddra, the line crosses a highly cultivated district which extends for three miles from the banks of the river.

The cultivation is wet, and the fertility of the soil depends on irrigation works, constructed some distance up the river. The ground is cropped with rice, sugar-cane, ginger, saffron, and pulses, and also carries cocoanut, banana, and soopari trees. Every square yard is under cultivation, the crops are finer, and the condition of the inhabitants better than any I have seen in India.

In grading the line here, my object has been to keep as low as possible without interfering with the irrigation. I have, accordingly, in the gradients, generally followed the inclination of the ground, keeping about 2′ 0″ or 2′ 6″ in bank, which allows, with girders and open culverts, sufficient headway for the

water in the irrigation channels. I have not interfered with a single irrigation channel, and the lowness of the bank will enable us to take up a minimum of land for the purpose of construction. In fact not more than ¾ a chain in width, or 6 acres per mile, will be required for the location of the line, and construction from side cutting. The side cutting must be so arranged as to stop short of the irrigation channels.

It would not have been difficult here, to have proposed a project involving heavy works and an entirely new system of scientific irrigation; but, as the present system works well and has enriched the cultivators, who have the character of being exceedingly litigious, I have thought it better to leave the irrigation as it is now, making as few alterations and causing as little disturbance of vested rights as was possible.

Most of the sugar-cane here grown is converted into sugar at Chitwaddy, and the pans in which the cane juice is boiled are of local manufacture; the iron, which is extremely malleable, is obtained from an ironstone found in large quantities at Ramandroog, a hill station about 12 miles off. Mr. Conder informs me that the ironstone is smelted in earthen furnaces, a layer of ironstone alternating with one of charcoal, and the only blast used is the common smith's bellows. Nearly all the iron used in this district for agricultural purposes is thus obtained.

After leaving Chitwaddy a comparatively barren country is entered, and we ascend the valley of Sondoo, at the mouth of which, about a mile to the south of the line, lies Hospett, a town said to contain 7,000 inhabitants. I may here remark that an appendix is attached to this report, showing the towns and villages passed through, with their population, the labour and carriage obtainable, depth of wells, and a variety of useful information, collected by Mr. C. Brereton, Assistant Engineer.

The inhabitants of this valley are chiefly occupied in pastoral pursuits. They are extensive graziers, and possess large herds of goats and sheep which supply the markets of Hospett and Bellary. The wool is woven into a rough kind of blanket, used by the natives as a cloak: cartloads of these are annually exported to Canara, where they are in great request on account of their stoutness.

For about 12 miles the cultivation is sparse, the soil a red hungry gravel with occasional patches of blacksoil, but the country is well watered by the numerous streams that take their rise in the neighbouring hills. Near Gadiganoor we come on some fields, or more properly gardens, irrigated by wells, that grow some of the commoner vegetables, but it is not till we have turned round the Darojee tank, which irrigates about 600 acres of land to the north, that we reach the wide expanse of blacksoil plain in which Bellary stands.

Note.—10 carts a day are said to leave Gadiganoor for Bellary with vegetables and firewood obtained from the Babool, which is here plentiful.

This plain is cropped with the usual staples grown on blacksoil, and the cultivation is somewhat assisted by a certain amount of irrigation from tanks which principally depend for their supply of water on the local rains.

The extensive system of irrigation projected from the Toongabuddra, by the Madras Irrigation Company, has not yet been carried out, though the country has been surveyed and plans prepared. Water here is very scarce; the wells average in depth 40 feet, and most of them cannot be used for drinking, owing to the brackishness of the water.

The soil is strongly impregnated with salt, and from it, in the villages adjacent to Bellary, a rude manufacture of this article is carried on. The brackishness of the water about Bellary necessitates the Madras Railway Company bringing up the supply for their engines from the Huggry river, about 10 miles off.

I have thought it advisable to divide the line into two districts. District

No. 1 ends close to the Toongabuddra. District No. 2 includes the Toongabuddra and ends at Bellary. I have taken Carwar and Madras as the two ports at which materials from England should be delivered—materials for No. 1 to be delivered at Carwar, for No. 2 at Madras. I think the advantage of this is evident; for, independent of the gain of drawing materials from two depôts, by utilizing the Madras railway, the cost of a ton of materials delivered on No. 2 is Rs. 24 or 43, according to the class of materials carried, as against Rs. 63 on No. 1. On the face of this saving I should have been inclined to have had all materials from England delivered at Madras, notwithstanding the advantage to be derived from two depôts, had it not been for the difficulties involved in crossing the Toongabuddra.

The Toongabuddra cannot be rendered passable for carts under a large outlay; the crossing would have annually to be renewed after the rains, and it would not be prudent to commence this annual reconstruction before November. The nearest ford is 25 miles upstream at Humpasagra, and to deliver materials to the nearest point on No. 1, would involve a *detour* of 48 miles.

I do not expect sleepers on No. 2 will be supplied under Rs. 2-8-0. The only available forests are in Canara. Instead of sending the sleepers to Gudduk, and thence along the line over the Toongabuddra to No. 2, I believe it will be found more advantageous to float them down the Toongabuddra from the Canara forests. A considerable quantity of timber is thus annually brought to Hospett. The price of teak timber I have not been able to learn, but that of jungle timber is Rs. 1-4-0 per cubic foot, thus floated.

In the detailed estimates for Permanent way and Bridge work, I have put the carriage by road, from Carwar to the Toongabuddra, at annas 6 per ton per mile, and from Bellary to the Toongabuddra at annas 4 per ton per mile. This rate for cart hire from Carwar, as compared with the rate from Bellary, seems high, but it must be considered that carts are only procurable at Carwar during the cotton season on their return to the cotton districts, that the supply is, consequently, fluctuating, and that though the road is good as far as Gudduk, yet the Arbyle ghat has to be ascended, and the road from the railway at Bellary is a made road, bridged, and far superior to the country roads from Gudduk; moreover, the proportion of 6 annas to 4 is the ratio that exists in the hire of carriage between the Dharwar and Bellary districts.

I have used rubble in the abutments and wingwalls of the minor bridges, with ashlar stones underneath the girders. In the large bridges, over the Copal nullah and the Toongabuddra, I have used coursed rubble throughout, with 3 courses of blocking under the girders. The small height of bank (a table showing the height of bank is attached to each separate Bridge Estimate) will, I think, allow of rubble in the minor bridges being adopted with safety. All stations and culverts are also estimated to be built in rubble. This rubble is an exceedingly flat-bedded granite.

In estimating for culverts I have taken them at a fixed price the yard run, so much being added for the faces, which are a constant quantity, and have been reduced into yards run of culvert.

The banks will have principally to be constructed from side cutting, and in building these banks on blacksoil I would recommend that the side cuttings should not be taken out continuously, with an idea of forming side ditches to the line, but that the earth for the banks should be taken out from side pits at least 100 feet apart, and that the position of these pits be so selected as not to interfere with the culverts. Where the system of side cutting in blacksoil has been adopted so as to make the side cuttings serve for side trenches, without any reference to the position of the culverts, I have seen these cuttings turned into nullahs, the cess gradually fretting away, the culverts rendered useless and each rainy season further developing the mischief, until the safety of the bank has been endangered, and expensive remedial measures have had to be adopted. For

the extra lead, thus necessitated in procuring earth for the banks, I have added ½ anna per yard on the earthwork.

It will be seen from the drawings, which are framed on the type designs for State Railways, that I have adopted generally girders in preference to arches. My experience of arches in India leads me to believe, that it is advisable to adopt the best class of work procurable; and I do not think that arches with summered stones can be built from the granite of the district under Rs. 1-8-0 per foot cubic.

The employment of girders also reduces the height of banks, gives more headway, and affords greater facilities for passing traffic under the line.

As to the comparative durability of iron and stone we have no well recorded statistics of the life of a girder; but it is an ascertained fact that arches built of the best material and workmanship do fail on railways from the constant pounding to which they are subjected, though an arch of the same description on a road may be considered imperishable.

On the other hand girders under locomotive traffic have a tendency to split high abutments and piers, which is not the case with arches; but as the height of the bridges is small, I do not think this danger need be apprehended

In grading this line my object has been to get as light work as possible with a ruling gradient of in 100, and yet to be safe from the floods. With 1 in 100, as a ruling gradient, it would have been possible to have had a surface line over a great extent of the country, and to have materially reduced the work, had the elements of floods been omitted. Thus on the blacksoil plain, extending about 4 miles from Gudduk to 25 on the section, and on the plain in which Bellary itself stands, the line could have been made a surface line, but if the country is examined attentively, there are indications of great rushes of water, though there are but few well defined streams. The waterways I have allowed average 80 feet lineal per mile.

As a case in point I may mention what happened in my own experience on 5 miles of the G. I. P. Railway. The country over which the line here ran was an undulating blacksoil plain, and in its features not unlike those I have just mentioned. There was only one well defined nullah but three times was this portion of the line washed away. It had originally been graded as a surface line with the hope of saving work, and the original error of attempting to save work by grading too near the surface was twice repeated. Three times the banks had to be lifted, and the last time at a great inconvenience, for engines were then running with ballast and materials.

I have been liberal in the use of level crossings—separation of property in India causes more inconvenience than is generally supposed—and the speed of the trains being limited to 15 miles per hour reduces the danger that is generally supposed to attach to their use.

In all cases where the road is turned under a bridge over a stream I would recommend curtain walls to be put in, and the space between the abutments and wings pitched. Through the neglect of this precaution very serious damage often results to a bridge. The carts cut up the ground, a rush of water comes and gets at the foundations. This may not happen the first, the second, or the third year, but it is sure to occur eventually wherever the road is turned under a bridge over a nullah, and where the bridge is not protected by curtain walls and pitching.

The only two bridges of magnitude on the line are those over the Bhurra nullah at Copal and the Toongabuddra at Hooligi.

The former consists of 10 spans of 60 feet each, with plate girders and rests on wells on a rock foundation.

The Toongabuddra is an important structure; it has 28 spans of 82 feet

each. The girders are Warren with the roadway on the top, the piers rest on rock foundations, and are designed to be built of coursed rubble with three courses of blocking in the foundations and the same number under the girders each course to be 1′ 0″ in depth.

The Burra nullah drains an area of 530 square miles. Its discharge in cubic feet per second at highest known flood is 70·143 cubic feet and the mean velocity is 12·3. The theoretical area required for the discharge is, therefore, 5,611 square feet—I have allowed 5,230 up to flood line, and have kept the bottom of girders 6′ 0″ above this.

The foundations of this bridge vary from 10 to 19 feet in depth. Immediately overlying the rock and below the sand, the borings show a stratum of stiff clay, about 18 inches in depth. This clay would undoubtedly make a firstrate bed into which to drive the piles, and would prevent the water rising from below, a difficulty that always occurs, when piling is driven through sand on the top of rock, for the unevenness of the rocks prevents a tight joint being made between the piles and the foundation. But taking into consideration the length of piling that would be necessary, the distance from which timber would have to come, and the great likelihood that a steam engine with powerful pumps would be required to keep the water down, I have thought it advisable to use wells.

The fact, too, that probably no other bridge on the line will require an engine, has influenced me; for it would add considerably to the expense of these foundations to debit them entirely with the cost of an engine, and in addition to the engines, first cost, skilled labour would be required for its management, fuel would be dear and difficult to procure, and the conveyance from Carwar would be a work of trouble and expense, and would involve the strengthening of some of the road bridges. Excellent laminated granite is found within a mile of the bridge.

The head waters of the Toongabuddra rise in Canara, and the drainage area, for which provision has to be made, extends over 10,650 square miles. For some distance below, and for about 2 miles above bridge, the river is a succession of rapids, advantage of which is taken for irrigation. The theoretical area required for the discharge at highest flood is 32,570 square feet. The area provided to floodline is 31,503. The lowest part of the girders is 6′ 0″ above highest known flood level, and this distance has been kept in all bridges on the line except at Kooreekompa, where the 6′ 0″ is reduced to 4′ 9″. But as the railway bridge is alongside the road bridge, which has stood for years, as I have used girders where the road bridge has arches, and as I have given 94′ 0″ more feet of lineal waterway, I think no danger need be apprehended.

The foundations of the Toongabuddra bridge are on rock. On the Bombay side of the river there is a large mass of boulders which will have to be removed. Blasting will quickly effect this. Huge masses of sheet rock are scattered over the river—some of them rather shaken; but, I anticipate little difficulty in securing a sound foundation at a slight depth The sandy spits and islets shown on the plan overly a bed of rock. I think there will be no necessity to employ a pumping engine. The river is here cut up into numerous small channels—many of them partially dammed with boulders; and it will not be difficult to divert the water from one channel into another as occasion requires. Many of the foundations can be got in without these diversions, as the piers will stand on rock above the ordinary level of the water. A plan and section to a large scale of the crossing accompany the report. In foundations of this description it would be difficult to take measurements by which contractors could be paid with accuracy. I have, therefore, added Rs. 2 per yard on the masonry to cover all expenses of founding.

A careful examination was made of the river before the site of the bridge was selected, and, I think, the best one has been got. The highest flood level obtained by the engineers employed here coincides with that given by Colonel Hancock. Stone abounds near the site of the bridge.

The following is a summary of the estimate. Length of line 91¼ miles, to end of proposed Station yard, Bellary and Gudduk extension.

ABSTRACT OF COST.

Distance 91¼ miles.

	Total cost.			Cost per mile.		
	Rs.	a.	p.	Rs.	a.	p.
Earthwork	3,03,274	10	0	3,323	0	0
Bridges and culverts	8,87,833	0	0	9,730	0	0
Protection to bridges (Pitching and Fender walls)	12,885	0	0	141	0	0
Ballast in main line	1,79,685	0	0	1,968	0	0
Permanent way main line	19,95,553	2	0	21,868	0	0
Level crossings	71,825	0	0	787	0	0
Fencing	49,476	4	0	542	0	0
Stations including permanent way and ballast in sidings	4,38,237	0	0	4,802	0	0
Staff Quarters	62,000	0	0	679	0	0
Electric Telegraph	91,250	0	0	1,000	0	0
Land	1,09,400	0	0	1,199	0	0
	42,01,419	0	0	.....		
Superintendence @ 10 %	4,20,142	0	0	4,604	0	0
Contingencies @ 10 %	4,20,142	0	0	4,604	0	0
	50,41,703	0	0	55,247	0	0
Cost of Junction Siding	64,671	4	0			
Grand Total ...	51,06,374	4	0			

The quantity of iron required in the construction of the line is—

	Tons.
for permanent way in main line	6,631
for stations including sidings	753·47
for fencing including gates to level crossings, and guard rails	288·16
for bridge work	1,207
	6,879·63

The estimate for rails and plate girders has been framed from prices at which these articles were supplied in England, in May of this year, to Indian State Railways.

	£	s.	d.	
Rails	12	12	6	per ton.
Fish plates	11	0	0	,,
Fish bolts and nuts	20	10	0	,,
Fang bolts	18	0	0	,,
Spikes	16	0	0	,,
Plate girders	11	10	0	,,

I have taken freight at £ 3-10 per ton, and have added 5 per cent. for landing

charges, 5 per cent. for insurance, and also 5 per cent. for loss of material in permanent way. No information was available of the rate at which Warren girders were supplied in England, but I have taken £ 20 per ton as a fair price which with freight at £ 3-10-0 per ton, and 5 per cent. for each of the items of insurance and landing makes their delivery in India £ 25-10 per ton.

The local rate for earthwork seems to be about 2½ annas per yard. I have allowed 4½ and 4 for banks and cuttings respectively. The extra price for banks is given for the lead involved in making the banks from side cuttings which should not be less than 100 feet apart. The difference between 2½ annas and 4½ annas seems considerable, but it should be remembered that whilst the labourer gets paid his 2½ annas for every yard when deposited, the contractor has to find superintendence, set out his work, keep it in good shape, and repair the waste caused by the rains—a heavy item on new made banks in a black soil country.

Rubble masonry I have entered at Rs. 9 per yard, and have allowed one rupee more in stations, on account of the height and thinness of the walls. Material in the shape of an excellent building granite is abundant. In these districts I heard of rubble work being done at Rs. 5 per yard but on no extensive scale, and I think that Rs. 8-8-0 per yard, which was, I believe, the cost of this description of work executed by the Madras Railway Company, nearer the mark. The conditions of the cost of building vary but slightly throughout the line.

Coursed rubble is taken at Rs. 14 per yard. The prices at which this work has been done on the G. I. P. Railway with the same class of stone, and under nearly the same circumstances as regards lead, show the rate to be a fair one.

Blocking course at Rs. 1 and Ashlar at Rs. 1-8-1 per cubic foot, are good prices.

I have been liberal in my rates for foundations for bridges, and have allowed a rupee per cubic yard, whether the foundations are wet or dry. In giving this rate it should be stipulated, that the contractors should only be paid for a width equal to the dimensions of the masonry plus 6″ on each side of the footings. This stipulation renders contractors careful in taking out their foundations as near the size of the masonry as possible, a point that should not be disregarded in construction. A liberal price too in foundations will generally ensure the work being carried down to a good bottom, and save much unpleasantness between the Engineers and Contractors.

Where the line runs over black soil, ballast is scarce; some can be obtained from the nullahs, but the quantity will have to be supplemented by broken stones.

On other portions ballast will be procured without much trouble. The rate of one rupee a yard, fixed from a consideration of these points, is, I think, sufficient.

Teak sleepers have been taken at Rs. 2 each on No. 1 district. As the Conservator of Forest in Canara has offered to deliver teak sleepers at Gudduk, at Rs. 1-8 each, an extra eight annas is added on each sleeper for carriage which is ample, as the mean lead between Gudduk and the Toongabuddra is not 25 miles, and the weight of each sleeper is 56 lbs. As previously stated in this report, I do not think sleepers will be delivered on No. 2 district under Rs. 2-8-0.

The irrigated land on the eastside of the Toongabuddra has been estimated for at Rs. 500 per acre, cropped land under dry cultivation at Rs. 100, and uncropped land at Rs. 50.

Diversions are supposed to go into bank. Consequently as they are paid for in bank they have not been entered separately in the estimates.

Bellary is one of the most important stations in the Madras Presidency. It contains a population of 40,000 inhabitants, and is the centre of trade for the surrounding districts; it even influences the markets 100 miles to the west. Two mercantile firms have lately established cotton presses here, their agencies reach as far as Gudduk, and a considerable amount of cotton has been diverted

this year from the Dharwar Districts, and from what has hitherto been considered its legitimate destination, Bombay, to be pressed at Bellary for shipment to England *via* Madras.

In addition to its commercial element, Bellary has a military force consisting of the head quarters of the artillery for the ceded districts, a regiment of native cavalry, a European line regiment, and two line regiments of the native army. The cantonments are about two miles in length, and the civil station is also large.

The direction of the line into Bellary was fixed with a view of interfering as little as possible with the cantonment and civil station.

The line keeps on the north at the foot of a range of hills, that commands that side of the citadel, and misses the cantonments entirely. Some roads on the junction line between the Gudduk and Bellary station and the Madras Line, will require diverting and a level crossing, but no house property is touched. Had the line been kept on the south side of the citadel (though in this case, a better junction is obtainable with the Madras Line) there would have been great interference with house property and roads. Parade grounds, military buildings, and private dwellings, would have been cut up, and the narrow strip of land between the tank and fort, now occupied by the main road that leads from the camp and densely populated Cowl bazar to the civil station, must have been taken for the railway.

To obviate the road diversions and the level crossing I have just mentioned, I had a line run at the back of the Judge's house, joining the Madras Line below the Adoni road; but the gradients, both on the Madras Line and on the Bellary and Gudduk extension, were not such as to admit of a good station ground, and the distance of the point of junction, from the Madras Railway station and the city of Bellary, is considerable.

A reference to the plan, 4 chains to the inch, corresponding to the section, will elucidate these points.

It will be observed that the station of the Gudduk and Bellary extension is located about one mile from the Madras Railway, and is connected with it by a continuation of the main line laid with the double gauge. The situation of the Madras station is exceedingly good. The station is on the level, foundations are excellent, and the formation may be said to coincide with the surface of the ground; so that no heavy earthworks are required. In addition to the space at present occupied by their sidings, the Company have taken up ground towards the cemetery and Bank; the boundary walls of this additional land are marked on the plans, and the land thus taken up comprizes all that is really available for station purposes; for the ground begins to rise within the boundary walls on the side of the cemetery at 1 in 100, and falls on the side of the Bank, towards Madras, at the same rate.

Note.—This continuation of the main line makes distance from Gudduk to junction with Madras Line 92Ms., 16 Chs.

The rise of 1 in 100 on the side of the cemetery continues to within 6 chains of the end of the station yard proposed for the Gudduk and Bellary line.

This site was selected for the following reasons:—

1*st.*—The station ground is on the level, the earthworks are light, and good foundations are obtainable;

2*nd.*—The ground is not occupied with buildings, and its acquisition would be inexpensive, and

3*rd.*—The only other available ground for a station within a reasonable distance of the city is taken up by the Madras Railway Company.

The fact that the ground in question has been taken by the Madras Railway seems to prove that they calculate on additions to their station yard; and, though they may not require all they have taken, these additions would limit the space at the disposal of the Gudduk and Bellary extension. In the event of the development

of traffic, or even in first deciding what ground each railway should take, it would be difficult to assign to each railway the limits of their station yards. As possessors of the ground the Madras Railway would have the chief voice in this arrangement, and would naturally take care to protect what they consider their interests.

If, however, it could be so arranged that the details for the station yards of both railways and the management of traffic should be under one control—so that what are considered different interests should be made subservient to a well-considered scheme, framed to benefit the Public and both lines alike—it would then be a question whether the station for the Gudduk and Bellary extension, should not be transferred to the site partially occupied by the Madras Railway Company.

Should an arrangement to combine the station yards be possible, no passenger station and platform, goods shed, or latrines for the Bellary and Gudduk extension would be needed. The junction siding would not require to be laid with the mixed gauge; and the siding shown in blue on the broad gauge, together with the 14 feet turntable, could be dispensed with. It would be advisable to keep the rolling stock separate and thus a running and carriage shed and turntable would be wanted for the narrow-gauge line, and separate watering and fuel arrangements would also be desirable. I would keep the same extent of sidings, as at present shown, on the proposed station.

The approximate saving by combining the station yards would amount to Rs. 60,970-8-0.

Thus made out:—

	Rs.	a.	p.
Saving on junction and broad-gauge siding.	29,146	0	0
Do. on 14 feet turntable	1,718	8	0
Do. on latrines	1,012	0	0
Do. on passengers' platform.....	5,086	14	0
Do. on do. station	15,564	2	0
Do. on goods shed.....	8,443	0	0
Total saving Rs....	60,970	8	0

The mixed guage is estimated to be laid with outside rails 68 lbs. to the yard, the inner or 3rd rail being 40 lbs.

A table of rainfall for the last five years, the time for which records have been kept at Bellary and Hospett, is appended to the report, and the results, as tabulated, are as follows:—

Date.	*Bellary.* Rainfall during 12 months.	*Bellary.* Highest Rainfall in any one month.	*Bellary.* Highest Rainfall in any 24 hours.	*Hospett.* Rainfall during 12 months.	*Hospett.* Highest Rainfall in any one month.	*Hospett.* Highest Rainfall in any 24 hours.
		September.	September 9th		September.	Sept. 11th.
1868... ...	23·69	8·01	3·00	28·72	11·77	3·00
		August.	May 31st.		August.	June 1st.
1869... ...	13·02	5·11	2·26	17·00	6·90	2·70
		June.	June 13th.		June.	June 6th.
1870... ...	15·54	4·45	1·69	20·40	6·65	2·90
		September.	June 5th.		October.	Oct. 3rd.
1871... ...	18·35	4·50	1·75	15·35	3·80	2·30
		September.	September 8th		October.	Oct. 9th.
1872... ...	15·80	4·81	1·50	44·23	9·35	4·30

It will thus be seen that the—

		Inches.
Highest rainfall at Bellary during 12 months was	.....	23·69
Minimum ,, ,, ,,	.....	13·02
Highest ,, at Hospet ,,	.....	44·23
Minimum ,, ,, ,,	.....	15·35

Highest rainfall at Bellary during any one month	Sept. 1868	...8·01
,, Hospet ,,	Sept. 1868	...11·77

		Inches.
Highest rainfall at Bellary during any 24 hours.	Sept. 9th 1868	...3·00
,, Hospett ,,	Oct. 9th 1872	...4·30

No record of rainfall could be obtained either at Gudduk or Copal.

In permanently staking the line some alterations should be made in the location. The chief alterations required are between the 11th and 25th miles, and between Copal and the Toongabudra. A long straight extends for nearly 15 miles and to obtain this straight, ground better adapted for the construction of a railway has been lost sight of. A reference to the plan will show that, between the points I have mentioned, the direction of the drainage of the country is continually varying from the north to the south of the line. Instead of one long straight across the country the line should be swept gently in and out, so as to take advantage of the different watersheds as far as possible; this would considerably lessen the water-way now allowed and diminish risk to the line from floods.

Judicious curving also between Copal and the Toongabudra will lighten the gradients.

The levels have been referred to Mr. Buchanan's datum which is 100 feet below mean sea level at Carwar, and start from the Pier head, the level of which, as given by Mr. Buchanan, is 108·00.

The levels thus starting from the Pier head at Carwar, and reduced to the mean sea level at that place, differ from the Madras Railway levels at Bellary by 2·25, and from the G.I.P.R. levels at Sholapúr by 1·30, referred respectively to mean sea level at Madras and Bombay.

But though 108·00 has been given as the level of Carwar Pier head to a datum 100 feet below mean sea level, I have not been able to find any mark defining mean sea level, nor has the Port Officer heard of one. I, therefore, think that the mean sea level at Carwar is simply an approximation; for to obtain mean sea level accurately is a work of time and delicacy, and after the labour involved in settling the point, it is but natural to suppose that the mean sea level would have been marked in some conspicuous position.

The line *viâ* Dumul passes close by Moonderghee, a town of about the same size as Copul, and crosses the Toongabadra at a village called Kukoor, about a mile and a half up stream from the ferry boat established at Hessuroor, and 40 miles from the crossing on the direct line. The line then keeps close to the Toongabadra, crossing a number of important tributaries, and finally joins the direct route between Gudduk and Bellary at about 53½ miles close to the Hospett Station. The crossing at Kukoor is very good, the rock is exposed throughout the bed of the river, though at the abutment it underlies the surface at about a depth of 30 feet. The bridge would require about 16 openings of 82 feet spans as against 28 of the same span on the direct line. This alternative route, however, is 12 Ms. 78 Chs., or 13 miles longer than the line *viâ* Copal.

Again, an inspection of the accompanying list of bridges on the two lines of 44 feet span and upwards (minor bridges, culverts, earthwork &c., keeping about the same relatively on both lines mile for mile), will show that the bridging on the Dumul line is considerably in excess of that due to the 13 extra miles of length. This excess amounts to Rs. 71,000, and the whole length of the line from Gudduk to Hospett by Dumul being 66 miles, the increase of the masonry may be taken at Rs. 1,080 per mile. Now the cost per mile on the direct route is Rs. 55,247 per mile, and adding one thousand and eighty rupees for increased bridge work the cost is brought up to Rs. 56,327, which multiplied by 13 gives ..... Rs. 7,32,251

Add for extra station 3 units	,,	67,000
,, 1 unit	,,	27,000
Total Rs.		8,26,251
Add 10 per cent contingencies		82,625
,, superintendence		82,625
	Rs.	9,91,501

The cost, therefore, of the alternative line by Dumul may be said to be £100,000 in excess of that *viâ* Copal.

List of Bridges 40 feet and upwards between Gudduk and Hospett, via Copal.

Names of Rivers.	Spans.	Depth from centre bed of river to formation.
		Feet.
Jowl nullah	1 40	16
Gúdi nullah	4 40	16
Yekee nullah	2 40	12
Hurlapoor nullah	2 40	15
Sindee nullah	5 40	13
Cantishmapa nullah	2 40	13
Copal nullah	10 60	21
At 38 ms. 54 chs.	3 40	12
At 48 ms. 76 chs	1 40	10
Toongabudra river	28 82	32
Irrigation channel at 52 ms. 42 chs.	1 40	9

List of Bridges 40 *feet and upwards between Gudduk and Hospett, via Dumul and Hessuroor.*

Names of Rivers.	Spans.	Depth from centre bed of river to formation.
		Feet.
Gadi nullah	3 40	16
At 8 ms. 73 chs.	1 40	16
At 11 Ms. 33 „	1 40	14
Dumul nullah	3 40	23
At 16 ms. 52 chs	1 40	18
Hurihuly nullah	5 60	20
Oor nullah	3 40	15
Dumor Gutic nullah	3 40	15
Ghin nullah	3 40	14
Toongabadra river	16 82	45
Tulwakee nullah	2 40	23
Luchmore nullah	2 40	20
Battee nullah	3 40	16
Culvey nullah	4 60	28
Gowry nullah	2 40	20
Wudguchee nullah	5 60	28
Buskood nullah	3 40	30
Yerree nullah	1 40	15
Hugree nullah	10 60	30
Bulahonchi nullah	3 60	32
Gowripoor nullah	4 40	17

I examined the Toongabadra attentively for a crossing in the neighbourhood of Hessuroor; the one selected at Kukoor is, I think, the best.

A crossing was proposed at Korunhully, about 5 miles up stream from Hessuroor, which I have had surveyed, and a plan of which accompanies the Report. The proposed crossing is simply a mass of rubble stone, evidently intended to form an anicut, and the original design has either failed or been abandoned.

Should the rubble be removed, so as to get at the underlying rock, the rock itself lies too obliquely to the course of the river to build on.

The Dumul route was surveyed with the intention of keeping the line entirely in British territory; but should H. H. the Nizam be inclined to follow the example of Holkar, and advance the money necessary for the construction of the 27 miles that lie within his dominions, independently of the advantage gained by a shortened and cheaper line, it would be to the interest of the State to construct the line by Copal.

Tabular Statement showing population, labour supply, &c., of Villages adjacent to the Gudduk and Bellary extension.

Names of Villages.	No. of Inhabitants.	No. of Coolies.	No. of Carts.	Depth of Wells.	Description of Stone.	Lead of Stone.	Lead of Lime.
				Feet.		Miles.	Miles.
Gudduk...	10,320	1,200	10	30	Granite.	2	2
Betgerry	8,716	900	...	38	...	1½	1
Huttigerry	300	65	9	46	...	0½	0½
Kurniala	1,700	400	12	58	...	8	3
Hullipoor	2,257	750	20	40	...	7	3
Timapoor	830	300	25	45	...	6	4
Bunnecopoo	1,700	530	18	26	...	4	2
Thalakulla	2,500	800	30	28	...	3	3
Banapoor	570	160	15	23	...	5	1
Duddigal	155	20	2	30	...	1	2
Hulligira	549	180	4	25	...	2	3
Copal	5,339	800	100	30	...	0½	1
Bassapore	505	200	10	27	...	2	2
Ginigerry	660	280	4	27	...	3	3
Canakapoor	144	30	2	25	...	2	3
Bevinhully	240	60	5	32	...	2	2
Hitnal	940	450	30	25	...	2	3
Hooligi	593	220	3	20	...	3	4
Hassoor...	230	50	4	10	...	1	4
Chitwady	4,000	550	60	10	...	2	4
Hospett...	7,000	1,000	100	35	...	1	3
Unchanagoody	270	45	5	32	...	...	...
Sunkalapoor	220	40	15	25	...	1½	2
Vodrully	150	30	12	26	...	1	2
Pakanakenully ...	200	30	10	29	...	2	3
Bylodigira	500	150	35	18	...	1	1
Kakball...	400	90	20	25	...	0½	0½
Goonglavadigira ...	450	100	25	45	...	0¼	2
Durmasager	640	200	40	24	...	1	1
Gadiganoor	1,200	240	30	29	...	1	0½
Boovanullee	70	10	5	32	...	1	1
Coricompee	800	270	10	30	...	1½	1½
Basapore	250	40	6	27	...	1	1
Toranagul	1,200	300	20	25	...	0¼	0½
Darojee	2,000	600	30	22	..	0½	0½
Timlapoor	200	30	...	20	...	0½	0½
Kurtani...	2,000	500	50	29	...	1½	2
Veerapoor	270	55	7	30	...	2	...
Collagul...	340	80	20	27	...	1	4
Ullipoor	300	60	40	35	...	2	0¼
Bellary	40,000	...	...	38	...	0½	4

RAINFALL Returns at Bellary and Hospett.

Months.	1868.			1869.			1870.			1871.			1872.		
	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.
	Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
January	0·12	...	...	...	...	...	...	0·02	...	0·55	0·36	0·25	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	1·75	0·99	0·10	...	...	...	...	...	0·25	...	...	...	...	...	...
April	1·03	1·57	0·35	0·60	0·44	...	...	...	0·20	0·20	0·46	0·45	06·0	0·59	0·41
May	0·35	0·59	2·56	2·45	2·97	1·20	1·30	1·62	1·50	3·20	3·43	1·70	0·60	0·55	0·27
June	2·52	2·25	6·57	0·42	0·48	3·60	4·35	4·45	6·65	2·55	2·82	1·35	2·61	2·19	3·30
July	3·71	3·80	2·19	1·00	0·97	0·45	0·47	0·74	2·55	0·35	0·79	1·60	1·19	1·16	8·80
August...	3·92	3·93	3·08	6·15	5·11	6·90	2·90	2·70	3·10	1·20	1·62	3·45	0·45	0·54	11·35
September	6·42	8·01	11·77	2·00	2·11	1·80	1·95	1·95	0·85	3·97	4·50	2·50	5·72	4·81	8·10
October	2·42	2·08	2·10	1·97	0·87	2·75	3·40	3·13	4·50	2·00	1·75	3·80	5·42	5·04	9·35
November	0·50	0·47	...	...	0·07	0·30	0·60	0·93	0·80	2·15	2·62	0·25	0·87	0·74	...
December	...	...	...	0·10	...	...	...	...	...	...	...	...	0·60	0·18	2·65
Total ...	22·74	23·69	28·72	14·69	13,02	17·00	14·97	15·54	20·40	16·17	18·35	15·35	18·06	15·80	44·23

Greatest Rainfall for 24 *hours from* 1868 *to* 1872 *at Bellary and Hospett.*

	1868.			1869.			1870.			1871.			1872.		
	The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.		
	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospitall.	Hospett.	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospital.	Hospett
January	29th 0·12	.....	...	.....	.....	.....	.....	19th 0·02	...	17th 0·30	16 & 18th 0·18	17th 0·25	.....	.....	...
February	.....	.....	...	.....	.....	.....	.....	.....	...	.....	.....	...	.....	.....	...
March	28th 1·50	28th 0·72	31st 0·10	.....	.....	.....	.....	.....	21st 0·25	.....	.....	...	.....	.....	...
April	3rd 0·60	3rd 0·68	11ht 0·25	27th 0·55	27th 0·36	.....	.....	.....	20th 0·20	21th 0·20	21th 0·45	20th 0·30	19th 0·60	19th 0·45	5th&14th 0·20
May	6th 0·26	6th 0·46	30st 0·70	31st 2·00	31st 2·26	7th 1·00	7th 0·80	28th 0·35	8th 0·55	26th 1·00	26th 1·02	8th 0·70	2nd 0·45	2nd 0·46	2nd 0·27
June	5th 1·80	5th 1·52	3rd 19·2	17th 0·32	17th 0·36	1st 2·70	13th 1·92	13th 1·69	6th 2·90	5th 1·70	5th 1·75	2nd 0·65	7th 1·10	7th 0·95	20th 0·80
July	8th 1·57	8th 1·52	22nd 0·67	31st 1·00	31st 0·86	20th 0·15	4th 0·32	4th 0·34	10th 0·60	11th 0·30	18th 0·20	11th 0·50	16th 0·62	16th 0·40	16th 3·40
August...	2nd 2·50	2nd 2·35	2nd 0·50	16th 1·90	16th 1·22	28th 2·00	11th 2·00	11th 1·40	20th 0·80	29th 1·00	30th 0·83	29th 1·35	23rd 0·22	23rd 0·26	7th 2·40
September	10th 1·90	9th 3·00	11th 3·00	14th 0·70	30th 0·58	29 th& th 0·80	3rd 1·55	3rd 1·38	15th 0·35	27th 1·60	28th 1·74	5th 0·80	8th 1·90	8th 1·50	30th 1·30
October	15th 0·80	15th 0·77	7th 1·50	24th 0·70	27th 0·60	2nd&5th 0·65	20th 0·90	2nd 0·61	4th 2·00	19th 0·87	19th 0·60	3rd 2·30	9th 1·40	10th 1·50	9th 4·30
November	2nd 0·50	2nd 0·47	...	.....	1st 0·04	1st 0·30	16th 0·60	16th 0·55	3rd&4th 0·40	14th 1·15	14th 1·25	8th 0·15	15th 0·62	15th 0·42	...
December	.....	.....	...	16″0 0·10	.....	.....	.....	.....	...	.....	.....	...	9th 0·25	11th 0·08	9th 1·00

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Estimate cost of Way and Works for 48 miles 76 chains (for details see separate Estimate).

Description of Works.	Quantities.	Rate.	Per.	Amount. Indian.	Amount. English.
		Rs. a. p.		Rs. a. p.	Rs. a. p.
Earthwork including trimming of slopes as specified in line embankment	436,920	0 4 6	C. yard ...	1,22,883 12 0	
Ditto. in cutting ...	94,883	0 4 0	„ ...	23,720 12 0	
Earthwork excavation in foundations of bridges	7,782	1 0 0	„ ...	7,782 0 0	
Ballast for main line laid and trimmed	96,522	1 0 0	„ ...	96,522 0 0	
Teak timber in bed plates and packings of bridges fixed in place, inclusive of fastening	911	4 0 0	C. feet ...	3,644 0 0	
Wrought iron in plate girders ...	354·75	227 0 0	Tons	...	80,528 4 0
Fixing same	354·75	40 0 0	Tons	14,190 0 0	
Carriage of bridge material from Carwar, mean lead 168 miles, at 6 annas per ton per mile	194·75	63 0 0	...	12,269 4 0	
Carriage of bridge material from Carwar to Bhurra Nullah, 176 miles, at 6 annas per ton per mile ...	160	66 0 0	...	10,560 0 0	
Permanent way for main line ...	48·95	13,286 0 0	Mile ...	...	6,50,349 12 0
Carriage of permanent way from Carwar, average lead 168 miles ...	3,562	0 6 0	Ton per mile	2,24,406 0 0	
Laying of permanent way in main line as specified	86,152	0 8 0	Yard ...	43,076 0 0	
Teakwood sleepers in main line exclusive of stations...	97,900	2 0 0	Each ...	1,95,800 0 0	
Level crossings with gate lodges ...	10	1,920 0 0	„ ...	19,200 0 0	
Ditto. without	25	880 0 0	„ ...	22,000 0 0	
Fencing Complete	Miles 10	...	...	10,940 0 0	16,333 2 0
Culverts (*See* List)	...	...	...	33,372 8 0	
Rubble masonry in bridges	10,087	9 0 0	C. yard ...	90,783 0 0	
Coursed rubble in do.	1,188	14 0 0	„ ...	16,632 0 0	
Block in course in do.	2,394	1 0 0	C. feet ...	2,394 0 0	
Ashlar in copings, caps, bed stones, and springers	9,609	1 8 0	„ ...	14,413 8 0	
Brickworks in wells including curbs.	430	12 0 0	C. yard ...	5,160 0 0	
Sinking wells	1,039	5 0 0	Lin. feet ...	5,195 0 0	
Concrete in wells	483	5 0 0	C. yard ...	2,415 0 0	
6″ cover stones for wells	35	50 0 0	Squares ...	1,750 0 0	
Pitching for bridges	1,694	3 0 0	S. yard ...	5,082 0 0	
Curtain walls for bridges	552	9 0 0	C. yard ...	4,968 0 0	
Land	420	100 0 0	Acre ...	42,000 0 0	
Do.	168	50 0 0	„ ...	8,400 0 0	
Stations.					
Hurlapoor (one unit)	...	...	...	17,512 10 0	9,216 10 0
Tullacul (one unit)	...	...	...	17,303 10 0	9,216 10 0
Copal (three units)	...	...	...	48,952 0 0	18,199 0 0
Assistant Engineer's house	1	8,000 0 0	Each ...	8,000 0 0	
Permanent way Inspectors	2	2,500 0 0	„ ...	5,000 0 0	
Electric Telegraph	48·95	1,000 0 0	Mile ...	17,132 8 0	31,817 8 0
Total.....	...	...	...	11,53,459 8 0	8,15,660 14 0

Total Cost ... ... Rs. 19,69,120
Add for Contingencies 10 per cent. 1,96,912
„ „ Superintendence 10 per cent. 1,96,912
Total ... Rs. 23,62,944

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Abstract of Quantities in Embankments.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	1,39,901	Brought over ...	2,88,502
1	368	19	295	37	10,963
2	754	20	12,099	38	845
3	1,545	21	7,228	39	296
4	3,052	22	7,898	40	2,254
5	13,768	23	12,041	41	6,466
6	26,118	24	4,636	42	25,954
7	15,822	25	26,024	43	9,886
8	1,860	26	5,513	44	1,712
9	1,233	27	3,678	45	11,228
10	7,153	28	16,405	46	12,337
11	35,257	29	6,500	47	34,558
12	24,122	30	21,569	48	14,212
13	103	31	2,363	49	2,287
14	5,245	32	1,162	50	1,770
15	142	33	341	51	968
16	342	34	15,767	52	6,195
17	103	35	4,245	53	1,408
18	2,914	36	837	54	5,079
Carried over.	1,39,901	Carried over.	2,88,502	Total C. yards.	4.36,920

Abstract of Quantities in Cutting.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	24,269	Brought over ...	51,385
1	1,471	19	1,118	37	1,767
2	347	20	355	38	1,365
3	139	21	304	39	589
4	846	22	862	40	262
5	1,175	23	600	41	1,538
6	13,874	24	759	42	1,050
7	106	25	430	43	4,937
8	213	26	430	44	803
9	361	27	213	45	6,556
10	216	28	275	46	1,866
11	2,357	29	6,531	47	1,082
12	781	30	4,633	48	1,403
13	1,433	31	4,127	49	455
14	170	32	1,523	50	4,212
15	170	33	381	51	6,027
16	132	34	690	52	3,283
17	84	35	2,519	53	5,403
18	394	36	1,366	54	900
Carried over.	24,269	Carried over.	51,385	Total C. yards.	94,883

CARWAR STATE RAILWAY.

GUDDUK TO TOONGABUDDRA RIVER.

District No. 1.

Quantities in Bridges.

Mileage.		Openings.	Foundations.	Rubble Masonry.	Ashlar.	Timber.	Amount.	Iron-work.	Amount.	Total amount.	Remarks.	Depth of Bank, Feet.
M.	Chs.	Feet.	C. yds.	C. yds.	C. ft.	C. ft.	Rs. a. p.	Tons.	Rs. a. p.	Rs. a. p.		
0	43	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		7
0	74	Two 20	219	314	236	20	3,479 0 0	4·50	1,485 0 0	4,964 0 0		10
1	33	One 40	267	336	206	10	3,640 0 0	6·25	2,062 8 0	5,702 8 0		16
2	76	Four 40	501	558	441	40	6,344 8 0	25·00	8,250 0 0	14,594 8 0		14
4	29	Two 40	166	226	216	20	2,604 0 0	12·50	4,125 0 0	6,729 0 0		9
4	46	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		8
7	39	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		13
8	78	Two 40	325	416	293	20	4,588 8 0	12·50	4,125 0 0	8,713 8 0		15
9	11	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		9
9	35	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
10	30	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
12	40	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
13	21	One 12	132	214	137	5	2,283 8 0	1·25	412 8 0	2,696 0 0		11
15	02	One 12	134	176	138	5	1,945 0 0	1·25	412 8 0	2,357 8 0		8
15	24	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
16	65	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		10
17	55	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
20	15	Two 12	231	355	226	10	3,805 0 0	2·50	825 0 0	4,630 0 0		13
20	40	Two 12	231	355	226	10	3,805 0 0	2·50	825 0 0	4,630 0 0		12
24	00	Three 12	202	266	273	15	3,065 8 0	3·75	1,237 8 0	4,303 0 0		9
25	24	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		11
26	77	Two 20	219	314	236	20	3,479 0 0	4·50	1,485 0 0	4,964 0 0		11
28	46	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
30	70	Five 40	298	393	489	50	4,768 8 0	31·25	10,312 8 0	15,081 0 0		9
32	02	Two 40	120	267	235	20	2,955 8 0	12·50	4,125 0 0	7,080 8 0		10
33	67	Ten 60	...	...	...	...	...	...	...	...	*See* Special Estimate.	12
34	03	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
35	22	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		7
38	54	Three 40	428	453	354	30	5,156 0 0	18·75	6,187 8 0	11,343 8 0		13
40	12	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
40	42	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
41	31	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		8
42	72	Three 12	202	266	273	15	3,065 8 0	3·75	1,237 8 0	4,303 0 0		8
43	64	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
44	06	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
44	72	Three 20	259	370	315	30	4,181 8 0	6·75	2,227 8 0	6,409 0 0		8
45	08	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
45	65	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		7
46	61	One 12	134	176	138	5	1,945 0 0	1·25	412 8 0	2,357 8 0		6
47	67	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		8
			7,524	10,087	8,213	505	1,12,646 8 0	194·75	64,267 8 0	1,76,914 0 0		

Schedule of Rates.

Excavation	Rs.	1	per C. yard.
Rubble Masonry.	„	9	„ „
Ashlar	„	1/8	„ C. Feet.
Timber	„	4	„ „
Ironwork	„	330	„ Ton.

Summary.

				Rs. a. p.
Excavation	7,524	C. yard at	Rs. 1	7,524 0 0
Rubble Masonry.	10,087	„ „	„ 9	90,783 0 0
Ashlar	8,213	C. Feet „	„ 1/8	12,319 8 0
Timber	505	„ „	„ 4	2,020 0 0
Ironwork	194¾	Tons „	„ 330	64,267 8 0
				1,76,914 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Details of cost of Ironwork in Girders.

Cost per Ton.	English. £. s. d.	English. Rs. a. p.	Indian. Rs. a. p.
Cost in England	17 10 0		
Insurance at 5 per cent...	0 17 6		
Landing charges, &c., at 5 per cent	0 17 6		
Freight to Carwar	3 10 0		
	22 15 0	say 227 0 0	
Carriage by road...	.....	.....	.....
Average lead 168 miles at 6 annas per ton per mile	.....	.....	63 0 0
Fixing Girders per ton	.....	.....	40 0 0
Total...	.....	227 0 0	103 0 0

Cost per Ton including Fixing Rs. 330
Length of District 49 Miles.
Average lead $\frac{49}{2}$ = 24½ „
Carwar to Gudduk = 143½ „
Total Lead... 168 „

Estimate of cost of Bridge over the Bhurra Nullah—Ten Spans of 60 Feet.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation to Foundations	258 C. yards.	1 0 0	258 0 0
Coursed Rubble	1,118 „	14 0 0	16,632 0 0
Block in course	2,394 C. feet.	1 0 0	2,394 0 0
Ashlar	1,396 „	1 8 0	2,094 0 0
Brick work in wells including curbs	430 C. yards.	12 0 0	5,160 0 0
Concrete filling wells	483 „	5 0 0	2,415 0 0
6″ Cover stones for wells...	35 Squares.	50 0 0	1,750 0 0
Pitching west abutment in mortar	18 Sq. yards.	3 0 0	54 0 0
Sinking wells	1,039 Linl. feet.	5 0 0	5,195 0 0
Timber	406 C. feet.	4 0 0	1,624 0 0
Ironwork in Girders including Fixing	160 Tons.	333 0 0	53,280 0 0
Total cost of Bridge...	...	...	90,856 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Details of cost of Ironwork in Girders for Bhurra Nullah.

Cost per Ton.	English.			Indian.		
	£. s. d.			Rs. a. p.		
Cost in England	17 10 0					
Insurance at 5 per cent....	0 17 6					
Landing charges, &c., at 5 per cent.	0 17 6					
Freight to Carwar	3 10 0					
	22 15 0	Say 227	0	0		
Carriage by road, 176 miles, at Rs. 0-6-0 per mile.	...	.....			66	0 0
Fixing Girders	...	.....			40	0 0
Total...	...	227	0	0	106	0 0

Cost of Girders per ton Rs. 333.

CARWAR STATE RAILWAY.

GUDDUK TO THE TOONGABUDDRA RIVER.

District No. 1.

Quantities in Culverts.

Mileage. Miles.	Mileage. Chs.	Openings.	Lineal yards.	Rate. Rs. a. p.	Amount. Rs. a. p.	Remarks.
0	15	5 Feet. ...	.....	...	395 0 0	Open.
1	24	5 „ ...	14·00	60 0 0	840 0 0	
3	42	3 „ ...	10·00	35 0 0	367 8 0	
4	08	5 „ ...	...	...	395 0 0	„
5	09	5 „ ...	...	...	395 0 0	„
5	45	5 „ ...	...	...	395 0 0	„
5	61	3 „ ...	9·50	35 0 0	332 8 0	
5	72	3 „ ...	9·50	35 0 0	332 8 0	
6	38	5 „ ...	12·00	60 0 0	720 0 0	
10	71	3 „ ...	9·50	35 0 0	332 8 0	
11	32	5 „ ...	...	...	395 0 0	„
12	13	5 „ ...	...	...	395 0 0	„
12	54	3 „ ...	9·50	35 0 0	332 8 0	
12	77	5 „ ...	...	...	395 0 0	„
13	42	5 „ ...	...	...	395 0 0	„
13	50	5 „ ...	...	...	395 0 0	„
13	72	5 „ ...	...	...	395 0 0	„
14	24	5 „ ...	...	...	395 0 0	„
14	59	5 „ ...	...	...	395 0 0	„
15	36	5 „ ...	11·00	60 0 0	660 0 0	
15	55	3 „ ...	10·50	35 0 0	367 8 0	
15	60	5 „ ...	11·00	60 0 0	660 0 0	
15	72	5 „ ...	11·00	60 0 0	660 0 0	
16	11	5 „ ...	14·00	60 0 0	840 0 0	
16	33	3 „ ...	10·50	35 0 0	367 8 0	
17	23	3 „ ...	10·50	35 0 0	367 8 0	
17	28	3 „ ...	11·50	35 0 0	402 8 0	
18	26	2 „ ...	...	...	190 0 0	„
18	38	3 „ ...	10·50	35 0 0	367 8 0	
18	51	3 „ ...	11·50	35 0 0	402 8 0	
18	73	3 „ ...	9·50	35 0 0	332 8 0	
19	18	5 „ ...	11·00	60 0 0	660 0 0	
19	28	3 „ ...	9·50	35 0 0	332 8 0	
19	41	5 „ ...	11·00	60 0 0	660 0 0	
19	57	5 „ ...	11·00	60 0 0	660 0 0	
19	78	5 „ ...	12·00	60 0 0	720 0 0	
20	28	3 „ ...	13·50	35 0 0	472 8 0	
20	69	2 „ ...	...	...	190 0 0	„
20	79	3 „ ...	10·50	35 0 0	367 8 0	
21	06	3 „ ...	9·50	35 0 0	332 8 0	
21	28	5 „ ...	10·00	60 0 0	600 0 0	
21	34	3 „ ...	9·50	35 0 0	332 8 0	
21	57	3 „ ...	9·50	35 0 0	332 8 0	
21	63	3 „ ...	9·50	35 0 0	332 8 0	
21	78	3 „ ...	9·50	35 0 0	332 8 0	
		Carried over...	...	...	19,940 0 0	

Quantities in Culverts—continued.

Mileage.		Openings.	Lineal yards.	Rate.			Amount.			Remarks.
Miles.	Chs.			Rs.	a.	p.	Rs.	a.	p.	
		Brought over.	...		...		19,940	0	0	
22	16	2 Feet ...	...		...		190	0	0	Open
22	29	3 „ ...	9·50	35	0	0	332	8	0	
22	48	3 „ ...	9·50	35	0	0	332	8	0	
22	79	3 „ ...	9·50	35	0	0	332	8	0	
23	17	3 „ ...	9·50	35	0	0	332	8	0	
23	44	3 „ ...	9·50	35	0	0	332	8	0	
24	25	3 „ ...	9·50	35	0	0	332	8	0	
25	00	5 „ ...	...		...		395	0	0	„
26	11	2 „ ...	...		...		190	0	0	„
26	32	5 „ ...	...		...		395	0	0	„
27	29	3 „ ...	11·50	35	0	0	402	8	0	
27	50	5 „ ...	11·00	60	0	0	660	0	0	
29	48	2 „ ...	...		...		190	0	0	„
30	11	2 „ ...	...		...		190	0	0	„
31	19	3 „ ...	9·50	35	0	0	332	8	0	
32	70	5 „ ...	...		...		395	0	0	„
37	10	5 „ ...	15·00	60	0	0	900	0	0	
37	22	5 „ ...	19·00	60	0	0	1,140	0	0	
37	30	2 „ ...	18·00	25	0	0	450	0	0	
37	32	2 „ ...	18·00	25	0	0	450	0	0	
39	00	2 „ ...	8·00	25	0	0	200	0	0	
39	07	2 „ ...	5·00	25	0	0	125	0	0	
39	42	5 „ ...	17·00	60	0	0	1,020	0	0	
39	58	5 „ ...	10·00	60	0	0	600	0	0	
39	72	2 „ ...	5·00	25	0	0	125	0	0	
43	27	3 „ ...	9·50	35	0	0	332	8	0	
45	16	3 „ ...	8·50	35	0	0	297	8	0	
45	24	3 „ ...	10·50	35	0	0	367	8	0	
45	40	3 „ ...	9·50	35	0	0	332	8	0	
47	28	5 „ ...	...		...		395	0	0	„
47	56	5 „ ...	...		...		395	0	0	„
47	77	5 „ ...	10·00	60	0	0	600	0	0	
48	42	3 „ ...	10·50	35	0	0	367	8	0	
							33,372	8	0	
5 Feet Culverts		... ...	210·00	60	0	0	12,600	0	0	
3 „ „		... ...	330·50	35	0	0	11,567	8	0	
2 „ „		... ...	54·00	25	0	0	1,350	0	0	
5 „ Open		... ...	17	395	0	0	6,715	0	0	
2 „ „		... ...	6	190	0	0	1,140	0	0	
		Total.....	...		...		33,372	8	0	

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Estimate of cost of one Level Crossing with Gate Lodge complete as per General Drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Rubble Masonry	56 C. yards.	10 0 0	560 0 0
Timber	11 C. feet.	4 8 0	49 8 0
Corrugated Iron in roof	6 Squares.	40 0 0	240 0 0
Earthwork in approaches 2-200′ × 18′ × 1′ ...	176 C. yards.	0 4 6	49 8 0
Broken Stone Metalling 2-200′ × 12′ × 6″ ...	90 „	1 8 0	135 0 0
Stone Gates Post including fixing	4 No.	26 0 0	104 0 0
Iron Gates 4 at 5 cwt. each	1 Ton.	350 0 0	350 0 0
Guard Rail 2·200lbs. say ·18	18 „	175 0 0	31 8 0
Fixing do.	2 No.	3 0 0	6 0 0
Carriage of Gates and Guard Rails Average lead 168 miles at 0-6-0 Rs. 63 per ton	1·18	63 0 0	74 5 0
2 Cattle-guard Frames Timber	64 C. feet.	5 0 0	320 0 0
Cost of one Level Crossing	...	...	1,919 13 0 say Rs. 1,920

Carwar to Gudduck 143½

Length of District 49 Miles $\frac{49}{2}$ = 24½ Average lead.

168

Estimate for Cattle Guard as per Type drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
4 Wooden Guard Frames	128 C. feet.	5 0 0	640 0 0
Stops for Carts	4 No.	1 8 0	6 0 0
2 Guard Rails (*See* Estimate for level crossings) including carriage			42 13 0
Fixing Guard Rails	2 „	3 0 0	6 0 0
Earthwork in approaches 2·200′ × 18′ × 1′...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2·200′ × 12′ × 6″	90 „	1 8 0	135 0 0
Total cost of Cattle Guard...	.....	.....	879 5 0 say Rs. 880

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

List of Level Crossings.

No.	Mileage.		Description.	Fencing.
	M.	Chs.		Lineal yards.
1	0	18	Level Crossing with Gate Lodge	440
2	0	57	Do. do. do.	484
3	1	18	Do. without do.	594
4	3	25	Do. do. do.	440
5	4	66	Do. do. do.	440
6	5	66	Do. do. do.	418
7	7	12	Do. do. do.	440
8	9	70	Do. with do.	440
9	10	61	Do. without do.	396
10	13	32	Do. do. do	308
11	18	68	Do. do. do, ...	572
12	19	32	Do. do. do.	418
13	21	16	Do. do. do.	440
14	22	52	Do. do. do.	396
15	24	76	Do. do. do.	396
16	25	61	Do. with do.	440
17	26	62	Do. without do.	440
18	27	76	Do. do. do.	440
19	28	37	Do. do. do.	440
20	30	5	Do. with do.	1,320
21	32	13	Do. without do, ...	440
22	33	48	Do. do. do.	440
23	34	16	Do. do. do.	440
24	34	50	Do. do. do.	440
25	35	0	Do. do. do	440
26	35	23	Do. with do.	1,100
27	35	37	Do. without do.	638
28	35	77	Do. do. do.	440
29	36	30	Do. do. do.	440
30	37	0	Do. with do.	440
31	39	60	Do. do. do.	176
32	41	43	Do. without do.	440
33	42	40	Do. with do.	880
34	46	40	Do. without do.	440
35	47	53	Do. with do.	264
36	48	50	Do. do. do.	440
			Fencing Total Lineal yards.....	17,600

Summary.

11 Level Crossings with Gate Lodge.
25 Do. without do.
10 Miles Fencing.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No 1.

Estimate of cost of one mile of Fencing Material to be delivered in Carwar.

Description.	Materials required.
Straining Posts	10 No.
Screw Bases	587 „
Intermediate Posts	587 „
Wedges	587 „
Bolts for Straining Posts	100 „
Wire	40½ Cwt

Total weight of Materials 13 *tons.*

Description.	Quantities.	Rates.	English.	Indian.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Straining Posts	10 No.	8 8 0	85 0 0	
Screw Bases...	587 „	1 0 0	587 0 0	
Intermediate Posts...	587 „	0 10 0	366 14 0	
Wedges	587 „	0 1 0	36 11 0	
Bolts for Straining Posts	100 „	0 5 0	31 4 0	
Wire	40½ Cwt.	13 0 0	526 8 0	
Carriage of Materials Average lead 168 miles, at 6 annas per ton per mile	13 Tons.	63 0 0	.....	819 0 0
Fixing Fencing	1,760 L. yds.	0 2 6	.....	275 0 0
Total...	.....	.....	1,633 5 0	1,094 0 0

Carwar to Gudduk	143½	Miles.
Length of District 49 miles $\frac{49}{2}$ ...	24½	„
Average lead	168	„

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Estimate of cost of one mile of Permanent Way Materials delivered at Carwar.

Materials.	Weight.	Rate.	Amount.	
	Tons.	£ s. d.	£ s. d.	Rs. a. p.
Rails	67·37	12 12 6	850 11 0	
Fish plates	1·92	11 0 0	21 2 0	
Fish bolts and nuts	·74	20 10 0	15 3 0	
Fang bolts and washers	1·20	18 0 0	21 12 0	
Spikes	1·54	16 0 0	25 8 0	
Total...	72·77	...	933 16 0	
Freight to Carwar	72·77	3 10 0	254 14 0	
Insurance at 5 per cent.	...	...	46 14 0	
Landing Charges at 5 per cent.	...	...	46 14 0	
Loss of material at 5 per cent.	...	...	46 14 0	
Total...	...	...	1,328 12 0	13,286 0 0

Materials.	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward.....Rs.	13,286 0 0	.....
Carriage of 72·77 tons, 168 miles at 0-6-0 per ton per mile (143½ Carwar to Gudduk, 24½ mean lead from Gudduk to Toongabuddra)	.....	4,585 0 0
Teak Sleepers supplied from Carwar delivered 2,000 at Rs. 2 each	.....	4,000 0 0
Laying Permanent way at 0-8-0 per yard	.....	880 0 0
Total...	13,286 0 0	9,465 0 0

Total cost per Mile, Rs. 22.751.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No 1.

General Abstract of Quantities in Stations, &c.

	Excavation.	Excavation in Well.	Concrete.	Rubble.	Coursed Rubble.	Ashlar.	Rubble Arching.	Woodwork.	Panelled Doors and Windows.	Corrugated Iron Roofing.	Terrace Flooring.	Plastering.	Road Metalling.	Hard dry filling.	Flagging.	Doors of Sheds.	Earthwork in Sidings.	Ballast.	Iron Frame.
	C. yds.	C. yds.	C. yds.	C. yds.	C. yds.	C. ft.	C. yds.	C. ft.	Sq. ft.	Sqrs.	Sqrs.	Sqrs.	C. yds.	C. yds.	Sqrs.	Sq. ft.	C. yds.	C. yds	
Hurlapur Station ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	B. 2,346	800	...
Platform	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	...	...	...
Station House (one unit).	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (four units)... ...	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tullacul Station ...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	B. 871	690	...
Platform, ...	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	...	...	...
Station House (one unit)..	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (four units) ...	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copal Station	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	B 2,171 C. 1,694	2,225	...
Platform, ...	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	...	...	...
Station House (three units.)	309	...	217	443	4	...	10	474	350	45·71	10	37·11	...	...	...	...	...	...	...
Tank (eight units) ...	40	..	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	·50	...	...	...	...
Latrines	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel Stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Goods Shed	214	...	123	452	8	...	19	...	...	35·00	...	...	...	...	14·50	660	...	...	13
Total ...	1,213	669	831	2,127	767	1,271	46	902	680	122·23	18	61·85	912	581	16·20	660	B. 5,388 C. 1,694	3,715	13

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Station Materials Required.

Materials.	Hurlapoor.	Tullacul.	Copal.	Total.	
Tanks (units)...	4	4	8	16	
Watercranes	1	1	1	3	
Semaphore Signals	1	1	1	3	
Distance Signals	2	2	2	6	
Weighbridges	...	...	1	1	
Switches (ordinary)	3	3	9	15	
Crossings	3	3	9	15	
Permanent way in sidings	·35	·35	·80	1·50	Miles.
Fencing	·80	·8	·90	2·50	Do.
Distance in miles from Gudduk	9½	26½	·34½		

Weight of Material.

Materials.	Hurlapoor.			Tullacul.			Copal.		
	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.
		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.
Tanks (units)	4	0·25	1·00	4	0·25	1·00	8	0·25	2·00
Watercranes	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00
Semaphore Signals	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50
Distance Signals...	2	0.50	1·00	2	0·50	1·00	2	0·50	1·00
Weighbridges	...	...	...	...	...	...	1	1·50	1·50
Switches (ordinary)	3	0·45	1·35	3	0·45	1·35	9	0·45	4·05
Crossings...	3	0·20	0·60	3	0·20	0·60	9	0·20	1·80
Permanent way	·35	72·77	25·47	·35	72·77	25·47	·80	72·77	58·20
Fencing	·80	13·00	10·40	·80	13·00	10·40	·90	13·00	11·70
Total.....	...	...	42·32	...	...	42·32	...	...	82·75

Total amount 167·39 Tons.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY..

DISTRICT No 1.

Estimate of cost of Station Machinery for Hurlapoor.

Materials.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tank (units delivered in Carwar)...	4 No.	90 0 0	.....	.....
Watercranes	1 „	600 0 0	.....	600 0 0
Semaphore Signals...	1 „	160 0 0	.....	160 0 0
Distance Signals	2 „	180 0 0	.....	360 0 0
Switches (ordinary)	3 „	170 0 0	.....	510 0 0
Crossings	3 „	90 0 0	.....	270 0 0
Pump	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·35 Miles.	17,286 0 0	1,400 0 0	4,650 0 0
Fencing	·80 „	1,908 5 0	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	
Carriage from Carwar to Hurlapoor, 153 miles, at 6 annas per ton per mile	42·32 Tons	57 6 0	2,428 2 0	
Fixing point and crossings... ...	3 Sets.	30 0 0	90 0 0	
„ Station Machinery	4·50 Tons.	50 0 0	225 0 0	
Laying permanent way in sidings.	616 L. yds.	0 8 0	308 0 0	
Total...	.....	.....	4,991 2 0	9,216 10 0

Estimate of cost of Hurlapoor Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	240 C. yds.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar...	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows...	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earthwork in sidings	2,346 „	0 4 0	586 8 0
Ballasting	800 „	1 0 0	800 0 0
Total...	.....	.....	12,521 8 0

Total Cost.	Indian.. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,521 8 0	.....
Station materials	4,991 2 0	9,216 10 0
Total...	17,512 10 0	9,216 10 0

Total cost of Hurlapoor Station Rs. 26,729 4 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Estimate of cost of Station Machinery for Tullacul.

Materials.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Carwar)...	4 No.	90 0 0	.....	360 0 0
Watercranes (do. do.)...	1 „	600 0 0	.....	600 0 0
Semaphore Signals (do. do.)...	1 „	160 0 0	.....	160 0 0
Distance Signals (do. do.)...	2 „	180 0 0	.....	360 0 0
Switches (ordinary) (do. do.)...	3 „	170 0 0	.....	510 0 0
Crossings (do. do.)...	3 „	90 0 0	.....	270 0 0
Pump (do. do.)...	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·85 Miles.	17,286 0 0	1,400 0 0	4,650 0 0
Fencing	·80 „	1,908 5 0	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	.....
Carriage from Carwar to Tullacul, 170 miles, at 6 as. per ton per mile.	42·32 Tons.	63 12 0	2,697 14 0	.....
Fixing point and crossings ...	3 Sets.	30 0 0	90 0 0	.....
Do. Station Machinery ...	4·50 Tons.	50 0 0	225 0 0	.....
Laying permanent way in sidings ...	616 Lin. yds.	0 8 0	308 0 0	.....
Total ...	.....	.....	5,260 14 0	9,216 10 0

Estimate of cost of Tullacul Station.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation to foundations...	240 C. yds.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows	165 S. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earth work in sidings	871 „	0 4 0	217 12 0
Ballasting	690 „	1 0 0	690 0 0
Total ...	.....	.....	12,042 12 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,042 12 0	.....
Station materials	5,260 14 0	9,216 10 0
Total...	17,303 10 0	9,216 10 0

Total cost of Tullacul Station Rs. 26,520 4 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate of cost of Station Machinery for Copal.

Description.	Quantities.	Rate.	Amount.	
			Indian.	English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tank (units delivered in Carwar)	8 No.	90 0 0		720 0 0
Watercranes	1 „	600 0 0		600 0 0
Semaphore Signals ...	1 „	160 0 0		160 0 0
Distance Signals... ...	2 „	180 0 0		360 0 0
Weighbridges	1 „	900 0 0		900 0 0
Switches (ordinary) ...	9 „	170 0 0		1,530 0 0
Crossings...	9 „	90 0 0		810 0 0
Pump	1 „	1,000 0 0		1,000 0 0
Permanent way in sidings	·80 Miles.	17,286 0 0	3,200 0 0	10,629 0 0
Fencing.	·90 „	1,908 5 0	227 8 0	1,490 0 0
2 Cattle Guard Frames, Timber...	64 C. feet.	5 0 0	320 0 0	
Carriage from Carwar to Copal, 178 miles, at 6 as. per ton per mile... ...	82·75 Tons.	66 12 0	5,523 7 0	
Fixing point and crossings.	9 Sets.	30 0 0	270 0 0	
Do. station machinery...	7 Tons.	50 0 0	350 0 0	
Laying permanent way in sidings	1,408 L. yds.	0 8 0	704 0 0	
Total...	.....	.....	10,594 15 0	18,199 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate of cost of Copal Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundation	733 C. yards.	0 8 0	366 0 0
Do. to wells	223 „	2 0 0	446 0 0
Concrete	543 „	5 0 0	2,715 0 0
Rubble masonry	1,299 „	10 0 0	12,990 0 0
Coursed rubble	365 „	14 0 0	5,110 0 0
Ashlar	571 C. feet.	1 8 0	856 8 0
Rubble arching	37 C. yards.	16 0 0	592 0 0
Woodwork	512 C. feet.	4 8 0	2,304 0 0
Panelled doors and windows	350 S. feet.	1 8 0	525 0 0
Corrugated iron roofing	85·41 Squares.	40 0 0	3,416 6 0
Terrace flooring	10 „	15 0 0	150 0 0
Plastering	37·11 „	7 8 0	278 7 0
Road metalling	596 C. yards.	1 8 0	894 0 0
Hard dry filling	431 „	0 10 0	269 6 0
Earthwork in siding banks	2,171 „	0 4 0	542 12 0
Do. do. cuttings	1,694 „	0 4 0	423 8 0
Ballasting	2,225 „	1 0 0	2,225 0 0
Flagging	16·20 Squares.	50 0 0	810 0 0
Doors of Goods Shed	660 S. feet.	1 0 0	660 0 0
Iron Trusses 40 feet Spans 13 Spans (12 cwt. each	7·8 Tons.	290 0 0	2,262 0 0
Carriage of Iron Trusses from Carwar to Copal, 178 miles, at 6 annas per ton per mile ...	7·8 „	66 12 0	520 10 0
Total...	.....	.....	38,357 1 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	38,357 1 0	
Station materials	10,594 15 0	18,199 0 0
Total...	48,952 0 0	18,199 0 0

Total cost of Copal Station, Rs. 67,151 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT NO. 2.

Estimate of cost of Way and Works for 42 miles 24 chains (for details see separate estimates).

Description.	Quantity.	Rate.	Per.	Amount. Indian.	Amount. English.
		Rs. a. p.		Rs. a. p.	£. s. p.
Earthwork including trimming of slopes as specified in line embankments...	494,684	0 4 6	C. yards ...	1,39,129 14 0	
Do. cuttings...	67,161	0 4 0	...	17,540 4 0	
Do. excavation to foundation of bridges	9,445	1 0 0	...	9,445 0 0	
Ballast for main line laid and trimmed	83,163	1 0 0	...	83,163 0 0	
Teak timber in bed plates and packings of bridges fixed in place inclusive of fastening	750	4 0 0	C. feet ...	3,000 0 0	
Wrought iron in plate girders ...	313¼	.....	Tons ...	.....	71,107 12 0
Fixing do. do. ...	313¼	40 0 0	Tons ...	12,530 0 0	
Carriage of bridge materials from Madras to Bellary, 1st class rate, 304 miles, at 2 annas per ton per mile	313¼	38 0 0	...	11,903 8 0	
Do. do. from Bellary, half way along line 20 miles, at 4 annas ...	313¼	5 0 0	...	1,566 4 0	
Permanent way in main line ...	42·175	13,286 0 0	Mile ...	.....	5,60,337 0 0
Carriage of permanent way	42·175	1,745 0 0	...	73,595 6 0	
Laying permanent way in main line as specified	74,228	0 8 0	Lin yards...	37,114 0 0	
Teakwood sleepers on main line exclusive of stations	84,350	2 8 0	Each ...	2,10,875 0 0	
Level crossings with gate lodge ...	7	1,875 0 0	...	13,125 0 0	
Do. without do. ...	20	875 0 0	...	17,500 0 0	
Fencing complete, exclusive of stations	10	2,220 5 0	Mile ..	5,870 0 0	16,333 2 0
Culverts (*see* list)	...	.....	...	31,617 8 0	
Rubble masonry in bridges	13,020	9 0 0	C. yard ...	1,17,180 0 0	
Ashlar in copings, caps, bed stones, and springers	13,129	1 8 0	C. feet ...	19,693 8 0	
Cost of Toongabudra bridge ...	...	.....	...	1,71,258 0 0	137,445 0 0
Pitching to bridges	495	3 0 0	S. yard ...	1,485 0 0	
Curtain walls for bridges	150	9 0 0	C. yard ...	1,350 0 0	
Land	500	100 0 0	Per acre.	50,000 0 0	
Do. irrigated	18	500 0 0	...	9,000 0 0	
Stations.					
Hospett	...	.....	...	46,474 10 0	18,178 13 0
Gadiganoor	...	.....	...	16,305 0 0	9,216 10 0
Kourtani	...	.....	...	16,385 8 0	9,216 10 0
Bellary	...	.....	...	1,16,084 9 0	85,975 1 0
Resident Engineer's house	1	12,000 0 0	Each ...	12,000 0 0	
Assistant Traffic Superintendent's house	1	8,000 0 0	...	8,000 0 0	
Permanent way Inspector's house ...	2	2,500 0 0	...	5,000 0 0	
Guards and Drivers...	12	2,000 0 0	...	24,000 0 0	
Electric Telegraph	42·30	1,000 0 0	Mile ...	14,805 0 0	27,495 0 0
Total ...	...	.....		12,96,995 15 0	9,35,305 0 0

Total Cost	22,32,300
Add for contingences 10 per cent. ...	2,23,230
„ for superintendence 10 per cent. ...	2,23,230
Rupees...	26,78,760

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Abstract of Quantities in Embankment.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	90,542	Brought over...	1,76,078
54 A	7,494	67	15,184	80	4,217
55	27,220	68	5,416	81	6,874
56	236	69	3,060	82	22,626
57	2,698	70	6,306	83	288
58	2,142	71	2,072	84	7,176
59	3,210	72	1,824	85	7,828
60	1,359	73	5,131	86	7,249
61	4,493	74	630	87	38,580
62	831	75	2,601	88	3,443
63	22,528	76	1,138	89	59,438
64	11,034	77	12,655	90	1,59,245
65	4,871	78	17,566	91	1,642
66	2,426	79	11,953		
Carried over.	90,542	Carried over.	1,76,078	Total C. yds...	4,94,684

Abstract of Quantities in Cutting.

		Brought over.	23,151	Brought over...	42,353
55	355	69	8,047	81	1,040
56	280	70	862	82	5,948
57	1,821	71	213	83	4,917
58	619	72	1,261	84	2,157
59	1,488	73	621	85	5,917
60	1,980	74	1,238	86	3,133
61	2,050	75	698	87	2,777
62	3,327	76	1,117	88	427
63	1,213	77	3,053	89	170
64	1,578	78	298	90	1,280
65	1,684	79	469	91	1,194
66	2,270	80	1,325		
67	3,881				
68	605				
Carried over.	23,151	Carried over.	42,353	Total C. yds...	71,313

CARWAR STATE RAILWAY.

District No. 2.

TOONGABUDDRA RIVER TO BELLARY.

Quantities in Bridges.

Mileage.		Openings.		Foundations.	Rubble Masonry.	Ashlar.	Timber.	Amount.			Ironwork.	Amount.			Total Amount.			Remarks.	Depths of Bank.
M.	Chs.			C. yards.	C. yds.	C. feet.	C. feet.	Rs.	a.	p.	Tons.	Rs.	a.	p.	Rs.	a.	p.		Feet.
48	76	1	40	76	160	145	10	1,773	8	0	6·25	1,937	8	0	3,711	0	0		9
...	...	28	82	..	...	...	...	.....			...	.....			.....			See Special Estimate.	...
49	77	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
50	01	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
50	17	1	40	137	145	170	10	1,737	0	0	6·26	1,937	8	0	3,674	8	0		4
50	31	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		5
51	07	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
51	16	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
51	23	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		5
51	35	2	12	97	108	138	10	1,316	0	0	2·50	775	0	0	2,091	0	0		3
51	45	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
51	52	2	12	97	108	138	10	1,316	0	0	2·50	775	0	0	2,091	0	0		3
51	64	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		3
52	04	3	12	117	141	162	15	1,689	0	0	3·75	1,162	8	0	2,851	8	0		3
52	09	2	12	97	108	138	10	1,316	0	0	2·50	775	0	0	2,091	0	0		3
52	12	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		2
52	21	1	12	77	75	114	5	943	0	0	1·25	387	8	0	1,330	8	0		5
52	42	1	40	137	145	170	10	1,737	0	0	6·25	1,937	8	0	3,674	8	0		4
55	60	2	12	169	213	206	10	2,435	0	0	2·50	775	0	0	3,210	0	0		6
56	38	4	20	299	426	394	40	4,884	0	0	9·00	2,790	0	0	7,674	0	0		5
56	56	1	12	132	214	137	5	2,283	8	0	1·25	387	8	0	2,671	0	0		11
57	67	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
58	13	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		13
58	61	1	30	349	656	1,386	...	8,332	0	0	...	.....			8,332	0	0	Arch.	25
59	29	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
61	09	1	20	251	373	801	...	4,809	8	0	...	.....			4,809	8	0	Arch.	18
61	52	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
61	60	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
62	00	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
63	10	2	12	169	213	206	10	2,435	0	0	2·50	775	0	0	3,210	0	0		7
63	43	2	12	167	223	205	10	2,521	8	0	2·50	775	0	0	3,296	8	0		9
63	60	2	12	167	223	205	10	2,521	8	0	2·50	775	0	0	3,296	8	0		9
64	49	1	12	134	176	138	5	1,945	0	0	1·25	387	8	0	2,332	8	0		6
66	39	1	12	134	176	138	5	1,945	0	0	1·25	387	8	0	2,332	8	0		7
66	68	1	20	179	258	157	10	2,776	8	0	2·25	697	8	0	3,474	0	0		10
67	30	1	20	179	258	157	10	2,776	8	0	2·25	697	8	0	3,474	0	0		10
68	07	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		9
68	16	1	12	134	176	138	5	1,945	0	0	1·25	387	8	0	2,332	8	0		8
68	53	1	40	76	160	145	10	1,773	8	0	6·25	1,937	8	0	3,711	0	0		9
69	30	2	12	167	223	205	10	2,521	8	0	2·50	775	0	0	3,296	8	0		8
70	12	2	20	219	314	236	20	3,479	0	0	4·50	1,395	0	0	4,874	0	0		9
71	16	9	40	45	370	907	90	5,095	8	0	56·25	17,437	8	0	22,533	0	0		8
72	63	2	12	167	223	205	10	2,521	8	0	2·50	775	0	0	3,296	8	0		5
72	69	3	20	259	286	315	30	3,425	8	0	6·75	2,092	8	0	5,518	0	0		6
73	55	5	40	298	393	489	50	4,768	8	0	31·25	9,687	8	0	14,456	0	0		11
76	03	1	40	76	160	145	10	1,773	8	0	6·25	1,937	8	0	3,711	0	0		9
77	02	1	40	76	160	145	10	1,773	8	0	6·25	1,937	8	0	3,711	0	0		9
77	67	2	20	219	314	236	20	3,479	0	0	4·50	1,395	0	0	4,874	0	0		10
78	47	2	20	219	314	236	20	3,479	0	0	4·50	1,395	0	0	4,874	0	0		10
81	24	2	20	219	314	236	20	3,479	0	0	4·50	1,395	0	0	4,874	0	0		10
82	65	1	40	267	336	206	10	3,640	0	0	6·25	1,937	8	0	5,577	8	0		12
84	16	2	40	120	267	235	20	2,955	8	0	12·50	3,875	0	0	6,830	8	0		12
85	71	3	40	428	453	354	30	5,156	0	0	18·75	5,812	8	0	10,968	8	0		12
86	57	2	20	219	314	236	20	3,479	0	0	4·50	1,395	0	0	4,874	0	0		10
87	68	1	12	132	180	137	5	1,977	8	0	1·25	387	8	0	2,365	0	0		9
88	44	2	40	120	267	235	20	2,955	8	0	12·50	3,875	0	0	6,830	8	0		12
89	07	3	20	259	370	315	30	4,181	8	0	6·75	2,092	8	0	6,274	0	0		10
				9,445	13,020	13,129	750	1,49,318	8	0	313·25	97,107	8	0	2,46,426	0	0	Irrigation openings.	

Schedule of Rates.	Rate. Rs.	a.	p.	Per
Excavation to Foundations ...	1	0	0	C. yards.
Rubble Masonry	9	0	0	" "
Ashlar	1	8	0	C. feet.
Timber	4	0	0	" "
Ironwork	310	0	0	Ton.

Summary.	Quantities	Rate. Rs.	a.	p.	Amount. Rs.	a.	p.
Excavation	9,445	1	0	0	9,445	0	0
Rubble Masonry	13,020	9	0	0	1,17,180	0	0
Ashlar	13,129	1	8	0	19,693	8	0
Timber	750	4	0	0	3,000	0	0
Ironwork	313¼	310	0	0	97,107	8	0
Total.....Rs.	.....	.....			2,46,426	0	0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Details of Cost of Ironwork in Girders.

Cost per Ton.	English. £ s. d.	English. Rs. a. p.	Indian. Rs. a. p.
Cost in England	17 10 0		
Insurance at 5 per cent....	0 17 6		
Landing charges, &c., at 5 per cent.	0 17 6		
Freight to Madras	3 10 0		
	22 15 0	say 227 0 0	
Carriage by rail to Bellary, miles 304, at 2 annas, 3rd class rate for goods	.....	.....	38 0 0
Do. by road, average lead 20 miles, at 4 annas.	.....	.....	5 0 0
Fixing Girders	.....	.....	40 0 0
Total...	.....	227 0 0	83 0 0

Cost per Ton including Fixing Rs. 310.
Length of District 40 miles, $\frac{40}{2}$ =20 miles average lead by road.

Estimate of Cost of Toongabuddra Bridge—28 Spans of 82 Feet.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Coursed rubble	4,578 C. yards.	14 0 0	64,092 0 0
Block in course	26,961 C. feet...	1 0 0	26,961 0 0
Ashlar	3,866 „ ...	1 8 0	5,799 0 0
Timber	1,260 „ ...	4 0 0	5,040 0 0
Ironwork including Fixing	539 Tons ...	363 0 0	1,95,657 0 0
Add 2 Rs. per yard on masonry on account of foundations exclusive of Ashlar	5,577 ...	2 0 0	11,154 0 0
Total...	...	...	3,08,703 0 0

Details of Cost of Ironwork in Girders for Toongabuddra Bridge.

Cost per Ton.	English.. £ s. d.	English.. Rs. a. p.	Indian. Rs. a. p.
Cost in England	20 0 0		
Insurance at 5 per cent.	1 0 0		
Landing Charges at 5 per cent.	1 0 0		
Freight to Madras	3 10 0		
	25 10 0	Say 255 0 0	
Carriage by Rail to Bellary 3rd Class rate for 304 miles, at 2 annas per ton per mile...	...	...	38 0 0
Carriage by Road for 40 miles, at 4 annas per ton per mile	...	...	10 0 0
Fixing Girders per ton	...	...	60 0 0
Total...	...	255 0 0	108 0 0

Cost of Girders per ton Rs. 363.

CARWAR STATE RAILWAY

TOONGABUDDRA RIVER TO BELLARY.

District No. 2.

Quantities in Culverts.

Mileage. Miles.	Mileage. Chains.	Openings.	Lineal Yards.	Rate.	Amount.	Remarks.
				Rs. a. p.	Rs. a. p.	Irrigation.
49	53	5 Feet ...	...	...	510 0 0	"
49	58	5 " ...	...	...	510 0 0	"
49	62	3 " ...	...	...	460 0 0	"
49	64	3 " ...	...	...	460 0 0	"
49	68	5 " ...	...	...	510 0 0	"
49	73	5 " ...	...	...	510 0 0	"
50	08	3 " ...	...	...	460 0 0	"
50	19	5 " ...	...	...	510 0 0	"
50	33	5 " ...	...	...	510 0 0	"
50	35	5 " ...	...	...	510 0 0	"
50	39	3 " ...	...	...	460 0 0	"
50	42	5 " ...	...	...	510 0 0	"
50	59	3 " ...	...	...	460 0 0	"
50	61	3 " ...	...	...	460 0 0	"
50	65	5 " ...	...	...	510 0 0	"
50	69	5 " ...	...	...	510 0 0	"
50	76	5 " ...	...	...	510 0 0	"
51	00	5 " ...	...	...	510 0 0	"
51	03	3 " ...	...	...	460 0 0	"
51	09	5 " ...	...	...	510 0 0	"
51	67	3 " ...	...	...	460 0 0	"
51	77	3 " ...	...	...	460 0 0	"
52	01	3 " ...	...	...	460 0 0	"
52	06	5 " ...	...	...	510 0 0	"
52	10	3 " ...	...	...	460 0 0	"
52	30	5 " ...	...	...	510 0 0	"
52	39	5 " ...	...	...	510 0 0	"
52	78	3 " ...	9·50	35 0 0	332 8 0	"
54	28	5 " ...	...	...	395 0 0	Open.
54	72	3 " ...	8·50	35 0 0	297 8 0	
55	41	3 " ...	7·50	35 0 0	262 8 0	
55	51	2 " ...	...	...	190 0 0	
55	69	2 " ...	9·00	25 0 0	225 0 0	
59	65	5 " ...	10·00	60 0 0	600 0 0	
64	35	5 " ...	14·00	60 0 0	840 0 0	
65	41	5 " ...	10·00	60 0 0	600 0 0	
66	10	3 " ...	10·50	35 0 0	367 8 0	
66	15	3 " ...	10·50	35 0 0	367 8 0	
66	22	3 " ...	9·50	35 0 0	332 8 0	
66	24	3 " ...	8·50	35 0 0	297 8 0	
66	27	3 " ...	8·50	35 0 0	297 8 0	
66	43	3 " ...	11·50	35 0 0	402 8 0	
67	43	5 " ...	13·00	60 0 0	780 0 0	
67	45	5 " ...	16·00	60 0 0	960 0 0	
68	41	3 " ...	9·50	35 0 0	332 8 0	
		Carried over...			21,100 0 0	

Quantities in Culverts—continued.

Mileage.		Openings.	Lineal Yards.	Rate.	Amount.	Remarks.
Miles.	Chains.			Rs. a. p.	Rs. p. p.	
		Brought over.	...	...	21,100 0 0	
68	71	3 Feet ...	8·50	35 0 0	297 8 0	
69	58	5 „ ...	...	...	395 0 0	Open.
70	30	3 „ ...	8·50	35 0 0	297 8 0	
71	56	5 „ ...	11·00	60 0 0	660 0 0	
72	76	5 „ ...	...	...	395 0 0	„
72	78	5 „ ...	...	...	395 0 0	„
73	22	5 „ ...	10·00	60 0 0	600 0 0	
73	30	5 „ ...	10·00	60 0 0	600 0 0	
73	76	5 „ ...	11·00	60 0 0	660 0 0	
74	52	5 „ ...	...	...	395 0 0	„
75	71	5 „ ...	11·00	60 0 0	660 0 0	
76	44	2 „ ...	...	...	190 0 0	„
78	64	5 „ ...	...	...	395 0 0	„
80	01	2 „ ...	...	...	190 0 0	„
80	30	5 „ ...	10·00	60 0 0	600 0 0	
80	70	3 „ ...	9·50	35 0 0	332 8 0	
81	18	5 „ ...	11·00	60 0 0	660 0 0	
81	46	2 „ ...	...	...	190 0 0	„
81	74	5 „ ...	10·00	60 0 0	600 0 0	
82	20	2 „ ...	...	...	190 0 0	„
83	36	5 „ ...	12·00	60 0 0	720 0 0	
83	60	3 „ ...	10·50	35 0 0	367 8 0	
83	71	3 „ ...	9·50	35 0 0	332 8 0	
84	64	5 „ ...	...	...	395 0 0	„
				Total.....	31,617 8 0	
	16	Irrigation ...	Culverts.	5 Feet ...	at 510 0 0	8,160 0 0
	11	„ ...	„	3 Feet ...	„ 460 0 0	5,060 0 0
	140½	Lineal yards.	3 Ft. Culverts.	...	„ 35 0 0	4,917 8 0
	159	„ „	5 Ft. „	...	„ 60 0 0	9,540 0 0
	9	„ „	2 Ft. „	...	„ 25 0 0	225 0 0
	7	5 Feet open.	Culverts.	...	„ 395 0 0	2,765 0 0
	5	2 „ „	„	...	„ 190 0 0	950 0 0
						31,617 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY

District No. 2.

Estimate of Cost of one Level Crossing with Gate Lodge complete as per general drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Rubble-Masonry...	56 C. yards.	10 0 0	560 0 0
Timber	11 C. feet.	4 8 0	49 8 0
Corrugated iron in roof	6 squares.	40 0 0	240 0 0
Earthwork in approaches 2×200′×18′×1′ ...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2′×200×12′×6″ ...	90 „	1 8 0	135 0 0
Stone Gate Posts including Fixing	4 No.	26 0 0	104 0 0
Iron Gates 4 at 5 cwt. each	1 Ton.	350 0 0	350 0 0
Guard Rail 2×200 lbs. say—·18 Tons... ...	·18 „	175 0 0	31 8 0
Fixing ditto	2 No.	3 0 0	6 0 0
Carriage of Gates and Guard Rails			
By rail from Madras to Bellary...			
First Class rate, 304 miles at 0-1-0=19 Rs. ...	1·18 Tons.	19 0 0	22 7 0
Carriage by road, 20 miles, at 0-4-0= 5 Rs. ...	1·18 „	5 0 0	5 14 0
Two Cattle Guard Frames, timber	64 C. feet.	5 0 0	320 0 0
Total...	.....	.....	1,873 13 0 say Rs. 1,875

Length of District 40 Miles.

$\frac{40}{2}$ = 20 Average lead.

Estimate for Cattle Guard as per Type Drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
4 Wooden Guard Frames	128 C. feet.	5 0 0	640 0 0
Stops for Carts	4 No.	1 8 0	6 0 0
2 Guard Rails (*See* Estimate for level crossings) including carriage	...	...	35 13 0
Fixing Guard Rails	2 „	3 0 0	6 0 0
Earthwork in approaches 2·200′×18′×1′ ...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2·200′×12′×6′ ...	90 „	1 8 0	135 0 0
Total cost of Cattle Guard...	...	...	872 5 0 say Rs. 875

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

List of Level Crossings.

No.	Mileage. M.	Mileage. Chs.	Description.	Fencing. Lin. yds.
1	49	52	Level Crossing with Gate Lodge	}
2	50	13	Do. without do.	} 5,280
3	50	75	Do. „ do.	}
4	52	70	Do. „ do.	440
5	53	24	Do. with do.	440
6	54	60	Do. without do.	440
7	57	40	Do. with do.	880
8	60	13	Do. without do.	792
9	60	70	Do. „ do.	440
10	62	28	Do. „ do.	264
11	66	55	Do. „ do.	440
12	68	33	Do. „ do.	572
13	70	24	Do. „ do.	440
14	70	60	Do. „ do.	880
15	71	68	Do. with do.	792
16	74	03	Do, „ do.	440
17	74	53	Do. „ do.	264
18	76	27	Do. „ do.	1,100
19	77	23	Do. without do.	176
20	78	57	Do. „ do.	440
21	79	40	Do. „ do.	440
22	80	23	Do. „ do.	440
23	83	50	Do. „ do.	440
24	87	13	Do. „ do.	440
25	88	0	Do. „ do.	440
26	88	66	Do. „ do.	440
27	89	47	Do. „ do.	440
				17,600

Summary.

7 Level Crossings with Gate Lodge.
20 Do. without do.
10 Miles fencing.

Estimate of cost of one mile of Fencing Materials to be delivered in Madras.

Description.	Materials required.
Straining Posts	10 No.
Screw Bases	587 „
Intermediate Posts	587 „
Wedges	587 „
Bolts for Straining Posts	100 „
Wire	40½ Cwt.

Total weight of materials 13 Tons.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of one mile of Fencing Materials, &c.—continued.

Description.	Quantities.	Rate.	English.	Indian.
		Rs. a. p.	£. s. d.	Rs. a. p.
Straining Posts	10 No.	8 8 0	85 0 0	.....
Screw Bases	587 „	1 0 0	587 0 0	.....
Intermediate Posts	587 „	0 10 0	366 14 0	.....
Wedges	587 „	0 1 0	36 11 0	.....
Bolts for Straining Posts	100 „	0 5 0	31 4 0	.....
Wire	40½ Cwt.	13 0 0	526 8 0	.....
Carriage from Madras to Bellary, 304 miles, 1st class goods, at 1 anna per ton per mile	13 Tons.	19 0 0	.....	247 0 0
Carriage from Bellary, average lead 20 miles, at 4 annas per ton per mile	13 „	5 0 0	.....	65 0 0
Fixing Fencing	1·760 Lin. yds.	0 2 6	.....	275 0 0
Total...	.....	.....	1,633 5 0	587 0 0

Estimate of cost of one mile of Permanent Way of both gauges, material to be delivered at Madras.

	Ton.	Rs.
Broad Gauge...	161·36	27,856
½ Narrow „	36·39	6,643
	197·75	34,499

	Amount.	
	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward...	34,499 0 0	.....
Carriage from Madras to Bellary of 197·75 tons, 1st class rate, at 1 anna per ton per mile, say Rs. 19	.....	3,757 0 0
Sleepers 1,760 at Rs. 5 each	.....	8,800 0 0
Laying permanent way, at 14 annas per yard	.....	1,540 0 0
Total...	34,499 0 0	14,097 0 0

Total cost per mile Rs. 48,596.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of one mile of Permanent Way. Materials to be delivered in Madras.

Description.	Weight.	Rate.	Amount.
	Tons.	£. s. d.	£. s. d.
Rails	67·37	12 12 6	850 11 0
Fishplates	1·92	11 0 0	21 2 0
Fishbolts and Nuts	·74	20 10 0	15 3 0
Fangbolts and Washers	1·20	18 0 0	21 12 0
Spikes	1·54	16 10 0	25 8 0
	72·77	...	933 16 0
Add—Freight	72·77	3 10 0	254 14 0
„ Insurance at 5 per cent.	...	...	46 14 0
„ Landing charges at 5 per cent.	...	...	46 14 0
„ Loss of Material at 5 per cent.	...	...	46 14 0
Total...	...	...	1,328 12 0
		or Rs...	13,286 0 0

Description.	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward...	13,286 0 0	
Carriage from Madras to Bellary, of 72·77 tons 304 miles 1st Class goods, at 1 anna per ton per mile, say Rs. 19 per ton...	...	1,382 0 0
Carriage from Bellary along line mean lead 20 miles, at 4 annas per ton per mile, say Rs. 5 per ton for the whole distance...	...	363 0 0
Sleepers 2,000 at Rs. 2 8 0 each.	...	5,000 0 0
Laying 8 annas per yard	...	880 0 0
Total...	13,286 0 0	7,625 0 0

Total cost per mile Rs. 20,911.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

General Abstract of Quantities in Station, &c.,

	Excavation to Foundations.	Excavation in Wells.	Concrete.	Rubble.	Coursed Rubble.	Ashlar.	Rubble Arching.	Woodwork.	Panelled Doors and Windows.	Corrugated Iron Roofing.	Terrace Flooring.	Plastering.	Road Metalling.	Hard Dry Filling.	Flagging.	Doors Shed.	Earthwork in Sidings	Ballast in Sidings.	Iron Trusses.
Hospett Station.																			
Platform, &c.	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	B. 4,033	2,349	
Station house (3 units)	309	...	217	443	4	...	10	474	350	45·71	10	37·11	...	...	...	...	...	...	...
Tank (8 units)	40	...	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	0·50	...	...	...	...
Latrine	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Goods Shed...	214	...	123	4 2	8	...	19	...	...	35·00	...	...	...	...	14·50	660	...	...	13
Gadiganoor Station.																			
Platform, &c.	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	B. 465	796	
Station house (1 unit)	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (4 units)	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well...	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kourtani Station.																			
Platform, &c.	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	1210	796	
Station house (1 unit)	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (4 units)	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bellary Station																	C. 5,400		
Platform, &c.	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	B. 17,100	9,487	
Station house (special drawing)	113	...	50	504	...	244	7	1,122	423	...	25·50	79·82	...	...	61·50	...	...	...	...
Tank (8 units)	40	...	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	335	...	..	105	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	0·50	...	...	...	...
Latrine	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel Stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Fuel Shed	...	...	...	...	...	...	...	318	...	22·17	...	...	...	...	...	...	...	...	...
Goods Shed...	214	...	123	452	8	...	19	...	...	35·00	..	...	...	...	14·50	660	...	...	13
Engine Shed including Ashpit	348	...	229	364	142	...	42	...	...	40·00	...	...	...	...	...	...	...	...	10
Carriage Shed	317	...	190	364	...	...	42	...	...	40·00	...	...	...	...	...	...	...	...	10
Engine Turntable	217	...	87	100	...	80	...	...	...	...	...	...	...	...	5·00	...	...	...	...
Carriage Turntable...	50	...	26	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total...	2,682	1,004	1,739	4,326	1,305	2,166	164	2,380	1,103	264·10	43·50	141·67	1,508	1,012	98·90	1,320	28,208	13,428	46

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Station Materials.

Materials.	Hospett.	Gadiganoor.	Kourtani.	Bellary.	Total.
Tank (units)	8	4	4	8	24
Watercranes	1	1	1	1	4
Semaphore Signals	1	1	1	1	4
Distance Signals	2	2	2	2	8
Weighbridges	1	...	...	1	2
Switches (ordinary)	9	3	3	28	43
Crossings	9	3	3	28	43
Turntable Engine	...	...	...	1	1
„ Carriage	...	...	...	1	1
Permanent way in sidings	·80	·35	·35	Narrow 2·40 Double ·77 Broad ·27	4·94
Fencing	·90	·80	·80	1·00	3·50
Distance in miles from Bellary	38	22	12	...	...

Weights of Materials.

Materials.	Hospett.			Gadiganoor.			Kourtani.			Bellary.			
	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.	
		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.	
Tanks (units)	8	0·25	2·00	4	0·25	1·00	4	0·25	1·00	8	0·25	2·00	
Watercranes	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00	
Semaphore Signals	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50	
Distance Signals	2	0·50	1·00	2	0·50	1·00	2	0·50	1·00	2	0·50	1·00	
Weighbridges	1	1·50	1·50	...	...	...	...	...	...	1	1·50	1·50	
Switches ordinary	9	0·45	4·05	3	0·45	1·35	3	0·45	1·35	28	0·45	12·60	
Crossings	9	0·20	1·80	3	0·20	0·60	3	0·20	0·60	28	0·20	5·60	
Turntable Engine...	...	...	...	...	...	...	...	...	...	1	8.50	8·50	
„ Carriage	...	...	...	...	...	...	...	...	...	1	1·50	1·50	
Permanent way in sidings ...	·80	72·77	58·20	.35	72·77	25·47	·35	72·77	25·47	2·40	72·77	174·65	Narrow.
										·77	197·75	152·27	Double.
										·27	161·36	43·57	Broad.
Fencing	·90	13·00	11·70	·80	13·00	10·40	·80	13·00	10·40	1·00	13·00	13·00	
Total.....	...	...	82·75	...	...	42·32	...	...	42·32	...	...	418·69	

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Hospett Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	733 C. yds.	0 8 0	366 8 0
Do. to wells	223 „	2 0 0	446 0 0
Concrete	543 „	5 0 0	2,715 0 0
Rubble masonry	1,299 „	10 0 0	12,990 0 0
Coursed rubble	365 „	14 0 0	5,110 0 0
Ashlar	571 C. feet.	1 8 0	856 8 0
Rubble arching	37 C. yds.	16 0 0	592 0 0
Woodwork	512 C. feet.	4 8 0	2,304 0 0
Panelled doors and windows	350 Sq. feet.	1 8 0	525 0 0
Corrugated iron roofing	85·41 Squares.	40 0 0	3,416 6 0
Terrace flooring	10 „	15 0 0	150 0 0
Plastering	37·11 „	7 8 0	278 7 0
Road metalling	596 C. yds.	1 8 0	894 0 0
Hard dry filling	431 „	0 10 0	269 6 0
Earthwork in sidings	40·33 „	0 4 0	1,008 4 0
Ballasting	23·49 „	1 0 0	2,349 0 0
Flagging	16·20 Squares.	50 0 0	810 0 0
Doors of goodsshed	660 Sq. feet.	1 0 0	660 0 0
Iron trusses, 40 feet spans, 13 spans (12 cwt. each)	7·8 Tons.	290 0 0	2,262 0 0
Carriage of iron trusses from Madras to Bellary, 1st class goods, at 1 anna per ton per mile	7·8 „	19 0 0	148 3 0
Carriage from Bellary to Hospett, 38 miles, at 4 annas per ton per mile	7·8 „	9 8 0	74 2 0
Total.....	.....	.....	38,224 12 0

Total Cost.	Indian.	English.
	Rs. a. p.	Rs. a. p.
Station-house, &c.	38,224 12 0	.....
Station materials	8,249 14 0	18,178 13 0
Total.....	46,474 10 0	18,178 13 0

Total cost of Hospett Station Rs. 64,653-7-0.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Station Machinery for Hospett.

Description.	Quantities.	Rate.	Amount.	
			Indian.	English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Madras).	8 No.	90 0 0	.....	720 0 0
Watercranes do.	1 „	600 0 0	.....	600 0 0
Semaphore Signals do.	1 „	160 0 0	.....	160 0 0
Distance Signals do.	2 „	180 0 0	.....	360 0 0
Weighbridges do.	1 „	900 0 0	.....	900 0 0
Switches (ordinary) do.	9 „	170 0 0	.....	1,530 0 0
Crossings do. do.	9 „	90 0 0	.....	810 0 0
Pumps do. do.	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·80 Mile.	.....	4,000 0 0	10,628 13 0
Fencing	·90 „	.....	247 8 0	1,470 0 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	.....
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton per mile	82·75 Tons.	19 0 0	1,572 4 0	.....
Carriage from Bellary to Hospett, 38 miles, at 4 annas per ton per mile	82·75 „	9 8 0	786 2 0	.....
Fixing point and crossings ...	9 Sets.	30 0 0	270 0 0	.....
„ station machinery ...	7 Tons.	50 0 0	350 0 0	.....
Laying permanent way in sidings.	1,408 Lin. yds.	0 8 0	704 0 0	.....
Total.....	.....	.....	8,249 14 0	18,178 13 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Station Machinery for Gadiganoor.

Description.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Madras).	4 No.	90 0 0	...	360 0 0
Watercranes	1 „	600 0 0	...	600 0 0
Semaphore Signals	1 „	160 0 0	...	160 0 0
Distance Signals	2 „	180 0 0	...	360 0 0
Switches (ordinary)	3 „	170 0 0	...	510 0 0
Crossings	3 „	90 0 0	...	270 0 0
Pump	1 „	1,000 0 0	...	1,000 0 0
Permanent way in sidings ...	·35 Mile.	...	2,058 0 0	4,650 0 0
Fencing	·80 „	...	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	·64 C. feet.	5 0 0	320 0 0	
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton per mile	42·32 Tons.	19 0 0	804 0 0	
Carriage from Bellary to Gadiganoor 22 miles, at 4 annas per ton per mile	42·32 „	5 8 0	232 12 0	
Fixing point and crossings ...	3 Sets.	30 0 0	90 0 0	
„ station machinery	4·50 Tons.	50 0 0	225 0 0	
Laying permanent way in sidings.	616 Lin. yds.	0 8 0	308 0 0	
Total.....	...	...	4,257 12 0	9,216 10 0

Estimate of cost of Gadiganoor Station.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation to foundations	240 C. yards.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yards.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and widows	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yards.	1 8 0	237 0 0
Hard dry filling	75 „	0 4 0	46 14 0
Earthwork in sidings	465 „	0 4 0	116 4 0
Ballasting	796 „	1 0 0	796 0 0
Total.....	...	...	12,047 4 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,047 4 0	
Station materials	4,257 12 0	9,216 10 0
Total	16,305 0 0	9,216 10 0

Total Cost of Gadiganoor Station Rs. 25,521-10-0.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of Kourtani Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	240 C. yds.	0 8 0	120 0 0
Do. to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing...	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earthwork in sidings	1,210 „	0 4 0	302 8 0
Ballasting	796 „	1 0 0	796 0 0
Total.....	...	...	12,233 8 0

Total Cost.	Indian.	English.
	Rs. a. p.	Rs. a. p.
Station-house, &c.	12,233 8 0	.....
Station materials	4,152 0 0	9,216 10 0
Total...	16,385 8 0	9,216 10 0

Total cost of Kourtani Station, Rs. 25,602 2 0

Estimate of cost of Station Machinery for Kourtani.

Description.	Quantities.	Rate.	Amount.	
			Indian.	English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Madras.)	4 No.	90 0 0	.....	360 0 0
Watercranes	1 „	600 0 0	.....	600 0 0
Semaphore Signals	1 „	160 0 0	.....	160 0 0
Distance Signals	2 „	180 0 0	.....	360 0 0
Switches (ordinary)	3 „	170 0 0	.....	510 0 0
Crossings	3 „	90 0 0	.....	270 0 0
Pump	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in Sidings ...	·35 Miles.	...	2,058 0 0	4,650 0 0
Fencing	·80 „	...	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber...	64 C. feet.	5 0 0	320 0 0	.....
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton, per mile... ...	42·32 Tons.	19 0 0	804 0 0	.....
Carriage from Bellary to Kourtani, 12 miles, at 4 annas per ton per mile	42·32 „	3 0 0	127 0 0	.....
Fixing points and crossings ...	3 Sets.	30 0 0	90 0 0	.....
„ station machinery	4·50 Tons.	50 0 0	225 0 0	.....
Laying permanent way in sidings.	616 Lin. yds	0 8 0	308 0 0	.....
Total.....	...	...	4,152 0 0	9,216 10 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Bellary Station.

Description.	Quantities.	Rate.			Amount.		
		Rs.	a.	p.	Rs.	a.	p.
Excavation to foundation	1,469 C. yards.	0	8	0	734	8	0
Do. to wells	335 „	2	0	0	670	0	0
Concrete	908 „	5	0	0	4,540	0	0
Rubble masonry...	2,199 „	10	0	0	21,990	0	0
Coursed rubble	538 „	14	0	0	7,532	0	0
Ashlar	895 C. feet.	1	8	0	1,342	8	0
Rubble arching	118 C. yards.	16	0	0	1,888	0	0
Woodwork	1,478 C. feet.	4	8	0	6,651	0	0
Panelled doors and windows	423 S. feet.	1	8	0	634	8	0
Corrugated iron roofing...	141·87 Squares.	40	0	0	5,674	12	0
Terrace flooring...	25·50 „	15	0	0	382	8	0
Plastering	79·82 „	7	8	0	598	10	0
Road metalling	596 C. yards.	1	8	0	894	0	0
Do. in diversion	880 „	1	8	0	1,320	0	0
Hard dry filling...	431 „	0	10	0	269	6	0
Earthwork in sidings bank	17,100 „	0	4	0	4,275	0	0
Do. do. cutting	5,400 „	0	4	0	1,350	0	0
Ballasting	9,487 „	1	0	0	9,487	0	0
Flagging...	82·70 Squares.	50	0	0	4,135	0	0
Doors of goods sheds	660 S. feet.	1	0	0	660	0	0
Iron trusses, 40 feet span, 33 spans, (12 cwt. each)	19·8 Tons.	290	0	0	5,742	0	0
Carriage of iron trusses, 1st class rate, 304 miles, at 1 anna	19·8 „	19	0	0	376	3	0
Total Rupees...	.....	...			81,146	15	0

Total Cost.	Indian.			English.		
	Rs.	a.	p.	Rs.	a.	p.
Station house, &c.	81,146	15	0			
do. materials	34,937	10	0	85,975	1	0
Total...	1,16,084	9	0	85,975	1	0

Total cost of Bellary Station, Rupees 2,02,059 10 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of Station Machinery for Bellary.

Description.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs a. p.
Tanks (units) delivered in Madras...	8 No.	90 0 0	...	720 0 0
Watercranes „ ...	1 „	600 0 0	...	600 0 0
Semaphore Signal „ ...	1 „	160 0 0	...	160 0 0
Distance Signals „ ...	2 „	180 0 0	...	360 0 0
Weighbridges „ ...	1 „	900 0 0	...	900 0 0
Switches (ordinary) „ ...	28 „	170 0 0	...	4,760 0 0
Crossings „ ...	28 „	90 0 0	...	2,520 0 0
Pump „ ...	1 „	1,000 0 0	...	1,000 0 0
Engine Turntable „ ...	...	...	...	6,000 0 0
Carriage Turntable „ ...	...	...	...	1,350 0 0
Permanent way, Narrow Gauge ...	2·40 Miles.	...	12,000 0 0	31,886 6 0
„ Double „ ...	·77 „	...	6,776 0 0	26,564 4 0
„ Broad „ ...	·27 „	...	2,376 0 0	7,521 2 0
Fencing	1·00 „	...	275 0 0	1,633 5 0
Cattle Guard Frame, Timber ...	32 C. feet	5 0 0	160 0 0	
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna, Rs. 19	418·69 Tons.	19 0 0	7,955 2 0	
Fixing points and crossings ...	28 Sets.	30 0 0	840 0 0	
„ station machinery ...	·17 Tons.	50 0 0	850 0 0	
Laying permanent way	7,410 L. yds.	0 8 0	3,705 0 0	
Total.....	...	...	34,937 2 0	85,975 1 0

Estimate of cost of Junction Siding with the Madras Railway Company, Bellary Station, laid on both Gauge.

Description.	Quantities.	Rate.	Indian.	English.
		Rs. a. p.	Rs. a. p.	£ s. d.
Earthwork in line including trimming of slopes embankment ...	844 C. yds.	0 4 0	211 0 0	
„ cutting ...	4,559 „	0 4 0	1,139 12 0	
„ in Road and Nullah Diversion	3,000 „	0 4 0	750 0 0	
Ballast in line laid and trimmed ...	3,850 „	1 0 0	3,850 0 0	
Permanent way in junction line including carriage	·93 Mile.	...	13,057 3 0	32,084 0 0
3rd rail laid in Bellary Station ...	·42 „	...	2,759 13 0	2,790 0 0
One level crossing with gate lodge (complete)	1 No.	1,875 0 0	1,875 0 0	
Fencing complete including carriage and fixing	1·32 Miles.	2,155 5 0	699 0 0	2,156 0 0
Cost of 1-12 feet Girder (*See* drawing No. 21)	...	...	1,945 0 0	387 8 0
Cost of road culvert	...	...	967 0 0	
Total.....	...	...	27,253 12 0	37,417 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of one mile of Permanent Way, Broad-Gauge Materials, to be delivered in Madras.

Materials.	Tons.	Rate. £. s. d.	£. s. d.	
Rails	106·86	12 12 6	1,349 2 0	
Fish-plates	5·60	11 0 0	61 12 0	
Spikes and bolts ...	4·90	18 10 0	80 13 0	
Chairs	44·00	10 0 0	440 0 0	
Total...	161·36	...	1,931 7 0	Say Rupees 19,313.

	Amount. English. Rs. a. p.	Amount. Indian. Rs. a. p.
Brought forward Rs.....19,313		
Freight at £ 3-10-0 per ton ... ... Rs. 5,648		
Insurance at 5 per cent. 965		
Landing charges at 5 per cent. 965		
Loss of Material at 5 per cent. 965	27,856 0 0	
Carriage from Madras to Bellary of 161·36 tons, 304 miles, 1st class Goods, at one anna per ton per mile, say Rs. 19 per ton...	.....	3,066 0 0
Sleepers 1,760 at Rs. 5 each.	.....	8,800 0 0
Laying permanent way at 8 annas per yard	.....	880 0 0
Total...	27,856 0 0	12,746 0 0

Total cost per mile Rs. 40,602.

Estimate of cost of Passenger Platform (one unit).

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation to Foundations	97 C. yards.	0 8 0	48 8 0
Rubble Masonry	195 „	10 0 0	1,950 0 0
Platform coping	350 C. feet.	1 8 0	525 0 0
Road metalling	158 C. yards.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Total...	.....	.....	2,807 6 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

Estimate of cost of Station House (one unit).

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	123 C. yards.	0 8 0	61 8 0
Concrete	97 „	5 0 0	485 0 0
Rubble Masonry	219 „	10 0 0	2,190 0 0
Coursed Rubble for Semaphore...	4 „	14 0 0	56 0 0
Rubble Arching	4½ „	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877· 8 0
Panelled Doors and Windows	165 Sq. feet.	1 8 0	247 8 0
Corrugated Iron roofing 10 per cent. overlap ...	18·41 Squares.	40 0 0	736 6 0
Terrace Flooring...	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Total...	...	...	4,878 10 0

Estimate of cost of Tank (4 units).

Description.	Quantities.	Rate.	Amount.
			Rs. a. p.
Excavation to Foundation	20 C. yards.	0 8 0	10 0 0
Coursed Rubble	127 „	14 0 0	1,778 0 0
Concrete	47 „	5 0 0	235 0 0
Total...	.....	...	2,023 0 0

Estimate of Ashpit.

Description.	Quantities.	Rate.	Amount.
			Rs. a. p.
Excavation to Foundations	31 C. yards.	0 8 0	15 8 0
Coursed Rubble...	55 „	14 0 0	490 0 0
Invert	8 „	16 0 0	128 0 0
Concrete	15 „	5 0 0	75 0 0
Timber	23 C. Feet.	4 0 0	92 0 0
Flagging	0·50 Square.	50 0 0	25 0 0
Iron Bolts 2′ 2″ × 1½″	16 No.	3 0 0	48 0 0
Total.....Rs.	.....	.....	873 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of Cost of Goods Shed.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	214 C. yards.	0 8 0	107 0 0
Concrete	123 „	5 0 0	615 0 0
Rubble Masonry	452 „	10 0 0	4,520 0 0
Coursed Rubble in Weighbridge	8 „	14 0 0	112 0 0
Rubble Arching	19 „	16 0 0	304 0 0
Corrugated Iron (10 per cent. per overlap) ...	35 Square.	40 0 0	1,400 0 0
Flagging	1450 „	50 0 0	725 0 0
Timber in Doors	660 Sq. feet.	1 0 0	660 0 0
Total.....Rs.	.....	.....	8,443 0 0

Estimate of cost of Latrines.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	13 C. yards.	0 8 0	6 8 0
Rubble Masonry	75 „	10 0 0	750 0 0
Timber	15 C. feet.	4 8 0	67 8 0
Corrugated Iron, including 10 per cent. for overlap	4·70 squares.	40 0 0	188 0 0
Total Cost...	.....	.....	1,012 0 0

Estimate of cost of Fuel Stage.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	9 C. yards.	0 8 0	4 8 0
Rubble Masonry	22 „	10 0 0	220 0 0
Ashlar	41 C. feet.	1 8 0	61 8 0
Flagging	1·20 Square.	50 0 0	60 0 0
Total...	...	...	346 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

Table of Gradients commences at Gudduk.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
0	0·00					2217·97
...	...	...	14·17	1 in 100		2227·32
...	14·17	...	29·00		Horizontal.	2227·32
...	29·00	...	54·11		1 in 100	2210·75
...	54·11	1	24·43		Horizontal.	2210·75
1	24·43	1	74·43	1 in 100		2243·75
1	74·43	2	5·59		Horizontal.	2243·75
2	5·59	2	51·32		1 in 100	2213·57
2	51·32	2	70·32		Horizontal.	2213·57
2	70·32	3	34·32	1 in 100		2242·61
3	34·32	3	45·32		Horizontal.	2242·61
3	45·32	4	15·82		1 in 100	2209·28
4	15·82	4	50·32		Horizontal.	2209·28
4	50·32	5	25·32	1 in 100		2245·58
5	25·32	5	31·32		Horizontal.	2245·58
5	31·32	5	63·32		1 in 300	2238·54
5	63·32	6	·32		Horizontal.	2238·54
6	·32	6	31·32		1 in 100	2218·08
6	31·32	6	47·32		Horizontal.	2218·08
6	47·32	6	58·32	1 in 100		2225·34
6	58·32	6	74·52		Horizontal.	2225·34
6	74·52	7	33·52		1 in 100	2199·60
7	33·52	7	44·32		Horizontal.	2199·60
7	44·32	8	12·32		1 in 210	2184·52
8	12·32	8	20·32		Horizontal.	2184·52
8	20·32	9	5·32		1 in 100	2141·62
9	5·32	9	31·45		Horizontal.	2141·62
9	31·45	10	12·45	1 in 230		2159·12
10	12·45	10	42·56		Horizontal.	2159·12
10	42·56	11	2·56	1 in 110		2183·12
11	2·56	11	9·56		Horizontal.	2183·12
11	9·56	11	37·56		1 in 276	2176·43
11	37·56	12	13·56		1 in 100	2139·47
12	13·56	12	70·56		Horizontal.	2139·47
12	70·56	13	14·56		1 in 100	2123·63
13	14·56	13	29·56		Horizontal.	2123·63
13	29·56	13	50·56	1 in 110		2136·23
13	50·56	13	57·99		Horizontal.	2136·23
13	57·99	14	4·56		1 in 260	2129·49
14	4·56	14	36·56		Horizontal.	2129·49
14	36·56	15	9·56		1 in 100	2094·51
15	9·56	15	32·56		Horizontal.	2094·51
15	32·56	16	0·56	1 in 500		2100·85
16	0·56	16	11·56		Horizontal.	2100·85
16	11·56	16	53·56		1 in 100	2073·13
16	53·56	16	75·56		Horizontal.	2073·13
16	75·56	17	13·56	1 in 110		2083·93
17	13·56	17	28·56		Horizontal.	2083·93
17	28·56	17	42·56		1 in 250	2080·23
17	42·56	17	60·56		Horizontal.	2080·23
17	60·56	17	74·56	1 in 160		2086·00
17	74·56	18	4·56		Horizontal.	2086·00

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
18	4·56	18	41·56		1 in 176	2072·13
18	41·56	19	51·56		1 in 400	2057·28
19	51·56	20	15·56		1 in 176	2040·78
20	15·56	20	65·56		Horizontal.	2040·78
20	65·56	21	75·56		1 in 1,000	2034·84
21	75·56	22	26·56		Horizontal.	2034·84
22	26·56	22	69·56		1 in 400	2027·75
22	69·56	23	34·56		1 in 1,100	2025·05
23	34·56	23	67·56		1 in 100	2003·27
23	67·56	24	5·56		Horizontal.	2003·27
24	5·56	24	25·56	1 in 150		2012·07
24	25·56	24	39·66		Horizontal.	2012·07
24	39·66	25	17·76		1 in 100	1973·72
25	17·76	25	37·76		1 in 150	1964·92
25	37·76	26	21·76		1 in 100	1922·68
26	21·76	26	44·76		Horizontal.	1922·68
26	44·76	26	62·21		1 in 100	1911·16
26	62·21	26	79·76		Horizontal.	1911·16
26	79·76	27	22·76		1 in 100	1895·98
27	22·76	27	54·43		Horizontal.	1895·98
27	54·43	28	1·76	1 in 400		1900·49
28	1·76	28	52·76		1 in 120	1872·44
28	52·76	29	0·76	1 in 434		1876·69
29	0·76	29	20·76		1 in 310	1872·43
29	20·76	29	46·76		1 in 100	1855·27
29	46·76	30	11·76		1 in 410	1848·03
30	11·76	30	52·21		1 in 100	1821·33
30	52·21	31	12·31		Horizontal.	1821·33
31	12·31	31	47·76	1 in 100		1844·73
31	47·76	31	53·76		Horizontal.	1844·73
31	53·76	32	4·76		1 in 100	1824·27
32	4·76	32	27·76	1 in 253		1830·27
32	27·76	33	6·69		1 in 340	1818·83
33	6·69	33	49·15		1 in 100	1790·81
33	49·15	33	60·69	1 in 132		1796·58
33	60·69	33	72·69		Horizontal.	1796·58
33	72·69	34	8·89		1 in 132	1788·48
34	8·89	34	15·69		Horizontal.	1788·48
34	15·69	34	45·69	1 in 132		1803·48
34	45·69	34	65·69		Horizontal.	1803·48
34	65·69	35	37·23	1 in 100		1837·50
35	37·23	35	43·23		Horizontal.	1837·50
35	43·23	36	5·23	1 in 100		1865·22
36	5·23	36	39·23	1 in 160		1879·24
36	39·23	36	53·23		Horizontal.	1879·24
36	53·23	38	57·23		1 in 110	1780·84
38	57·23	38	79·23	1 in 300		1785·68
38	79·23	39	13·23		Horizontal.	1785·68
39	13·23	39	40·23		1 in 100	1767·86
39	49·23	39	45·23		Horizontal.	1767·86
39	45·23	39	63·23	1 in 100		1779·74
39	63·23	39	76·23		Horizontal.	1779·74
39	76·23	40	31·23		1 in 100	1756·64
40	31·23	40	47·23		Horizontal.	1756·64
40	47·23	40	65·23	1 in 100		1768·52
40	65·23	40	73·23		Horizontal.	1768·52
40	73·23	41	13·23		1 in 100	1755·32
41	13·23	41	47·23		Horizontal.	1755·32
41	47·23	42	70·23		1 in 110	1693·52
42	70·23	43	8·81		Horizontal.	1693·52

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
43	8·81	43	48·81		1 in 240	1682·52
43	48·81	43	66·51		Horizontal.	1682·52
43	66·51	44	4·51		1 in 400	1679·55
44	4·51	44	26·51		1 in 160	1670·48
44	26·51	44	49·51		Horizontal.	1670·48
44	49·51	44	71·51		1 in 160	1661·41
44	71·51	45	9·11		Horizontal,	1661·41
45	9·11	46	27·11		1 in 260.	1636·53
46	27·11	47	6·11	1 in 300		1649·51
47	6·11	47	65·11		1 in 120	1617·06
47	65·11	47	74·51		Horizontal.	1617·06
47	74·51	48	28·51	1 in 200		1628·28
48	28·51	48	47·04		Horizontal.	1628·28
48	47·04	48	74·51		1 in 100	1610·15
48	74·51	49	47·21		Horizontal.	1610·15
49	47·21	49	56·21		1 in 100	1604·21
49	56·21	50	3·86		Horizontal.	1604·21
50	3·86	50	10·86	1 in 100		1608·83
50	10·86	50	22·86		Horizontal.	1608·83
50	22·86	50	27·86		1 in 200	1607·18
50	27·86	50	58·36		Horizontal.	1607·18
50	58·36	51	3·86	1 in 110		1622·48
51	3·86	51	6·86		Horizontal.	1622·48
51	6·86	51	15·86		1 in 100	1616·54
51	15·86	51	17·94		Horizontal.	1616·54
51	17·94	51	34·36	1 in 100		1627·38
51	34·36	51	46·36	1 in 600		1628·70
51	46·36	51	59·36		1 in 100	1620·12
51	59·36	51	66·36		Horizontal.	1620·12
51	66·36	52	5·36	1 in 100		1632·66
52	5·36	52	11·36		Horizontal.	1632·66
52	11·36	52	19·36		1 in 100	1627·38
52	19·36	52	23·36		Horizontal.	1627·38
52	23·36	52	42·36	1 in 100		1639·92
52	42·36	52	50·96		Horizontal.	1639·92
52	50·96	53	73·83	1 in 105		1704·58
53	73·83	54	43·83		Horizontal.	1704·58
54	43·83	55	54·18	1 in 132		1749·75
55	54·18	56	48·18	1 in 110		1794·15
56	48·18	57	73·18	1 in 132		1846·65
57	73·18	58	53·78	1 in 100		1886·65
58	53·78	59	45·78	1 in 230		1907·31
59	45·78	59	77·28	1 in 260		1915·30
59	77·28	60	26·78	1 in 110		1933·00
60	26·78	60	36·78		Horizontal.	1933·00
60	36·78	61	59·78		1 in 100	1865·02
61	59·78	62	22·78	1 in 350		1873·13
62	22·78	63	8·78		1 in 100	1829·57
63	8·78	63	33·78		Horizontal.	1829·57
63	33·78	64	7·78		1 in 450	1821·65
64	7·78	64	43·78		1 in 100	1797·89
64	43·78	64	53·78		Horizontal.	1797·89
64	53·78	65	21·78		1 in 100	1766·21
65	21·78	65	47·78		Horizontal.	1766·21
65	47·78	67	10·78		1 in 115	1695·62
67	10·78	67	31·78		Horizontal.	1695·62
67	31·78	68	67·38		1 in 380	1675·54
68	67·38	69	51·38		1 in 176	1651·54
69	51·38	70	43·38		Horizontal.	1651·54
70	43·38	70	63·38		1 in 100	1638·34

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
70	63·38	71	25·38		Horizontal.	1638·34
71	25·38	71	39·38		1 in 300	1635·26
71	39·38	72	2·18		Horizontal.	1635·26
72	2·18	72	54·18		1 in 170	1615·07
72	54·18	73	10·18		Horizontal.	1615·07
73	10·18	73	21·18		1 in 200	1611·44
73	21·18	73	34·18		Horizontal.	1611·44
73	34·18	73	52·18	1 in 200		1617·39
73	52·18	73	58·18		Horizontal.	1617·39
73	58·18	73	69·18		1 in 200	1613·76
73	69·18	74	25·18		Horizontal.	1613·76
74	25·18	74	43·18		1 in 300	1617·72
74	43·18	74	51·18		Horizontal.	1617·72
74	51·18	74	75·18		1 in 100	1601·88
74	75·18	75	35·18	1 in 132		1621·88
75	35·18	76	45·18		1 in 270	1599·88
76	45·18	77	13·14		Horizontal.	1599·88
77	13·14	77	60·14	1 in 180		1617·10
77	60·14	78	44·14	1 in 850		1622·07
78	44·14	78	58·14		Horizontal.	1622·07
78	58·14	79	72·14	1 in 150		1663·43
79	72·14	81	40·14		1 in 650	1650·43
81	40·14	81	74·14	1 in 270		1658·74
81	74·14	82	68·14		1 in 1,600	1655·69
82	68·14	83	16·14	1 in 900		1657·74
83	16·14	84	6·14		1 in 400	1646·19
84	6·14	84	18·14		Horizontal.	1646·19
84	18·14	84	36·14	1 in 300		1650·15
84	36·14	85	4·14		1 in 1,000	1646·98
85	4·14	85	34·94		1 in 150	1633·43
85	34·94	86	67·44		1 in 400	1614·87
86	67·44	87	7·44	1 in 220		1620·87
87	7·44	87	19·44		Horizontal.	1620·87
87	19·44	88	25·44		1 in 200	1592·49
88	25·44	88	79·39		Horizontal.	1592·49
88	79·39	89	23·39		1 in 200	1584·57
89	23·39	89	41·39		Horizontal.	1584·57
89	41·39	90	34·69	1 in 132		1621·22
90	34·69	91	26·19		Horizontal.	1621·22
91	26·19	92	7·19		1 in 100	1580·96
92	7·19	92	16·19		Horizontal.	1580·96

CARWAR STATE RAILWAY.

List of Bench Marks, Gudduk to Bellary.

No.	Description.	Near.	Reduced.
		M. Chs.	Level.
	On S.W. corner of verandah of Hospital at Gudduk... ...	...	2233·97
	„ Revenue Survey Stone, S.L.	0 75	2211·12
	„ „ „ „ N.L.	2 26	2224·52
	„ „ „ „ S.L.	3 05	2220·47
	„ „ „ „ S.L.	3 72	2233·01
	„ „ „ „ S.L.	5 18	2239·85
	„ „ „ „ S.L.	6 40	2213·79
	„ Imlee Tree, S.L.	8 40	2169·02
	„ Revenue Survey Stone, S.L.	9 38	2141·89
	„ Babool Tree, S.L.	10 42	2158·61
	„ „ „ N.L.	12 42	2136·07
	„ „ „ O.L.	14 03	2128·88
	„ Revenue Survey Stone, S.L.	15 25	2086·90
	„ Babool Tree, N.L.	16 23	2093·58
	„ „ „ S.L.	17 25	2078·88
	„ „ „ S.L.	18 25	2072·52
	„ Revenue Survey Stone, N.L.	19 62	2055·88
	„ „ „ „ N.L.	21 10	2044·16
	„ Stone Near Tank, N.L.	22 03	2037·10
	„ Shabhoo Tree, S.L.	23 38	2020·66
	„ Revenue Survey Stone, N.L.	25 23	1968·50
	„ Babool Tree, S.L.	26 77	1907·69
	„ Leem Tree, S.L.	28 03	1898·03
	„ „ „ N.L.	29 27	1869·73
	„ Small White Temple (P)	30 00	1851·95
	„ Revenue Survey Stone, S.L.	31 36	1839·65
	„ „ „ „ S.L.	32 78	1822·65
	„ Babool Tree, S.L	34 00	1787·56
	„ N. E. corner of Kutcherry at Copal (P)	35 13	1829·31
	„ Rock, S.L.	36 25	1875·04
	„ Stone, S.L....	37 03	1860·17
	„ Rock, S.L.	38 70	1786·00
	„ Rock near Tree, N.L.	40 04	1764·82
	„ Rock, S.L.	41 44	1753·91
	„ N. W. corner of Plinth of Temple (Kunkapoor) (P) ...	42 40	1702·59
	„ Rock, S.L.	44 00	1673·74
	„ „ N.L.	45 30	1658·11
	„ „ N.L.	46 43	1637·29
	„ „ near Tree, S.L.	48 03	1617·27
	„ S. E. corner of Temple near Hooligi (P)...	49 10	1597·08
	„ Stone, S.L.	50 17	1613·02
	„ Tree, S.L.	51 09	1622·40
	„ „ S.L.	52 00	1634·73
	„ Largest Stone in row, S.L...	53 48	1692·63
	„ Stone in bush, N.L.	54 48	1707·89
	„ Nearest Stone in row, S.L.	56 31	1783·98
	„ Stone, N.L...	61 28	1793·75
	„ „ S.L.	62 30	1875·70
	„ Stone in Nullah N.L.	63 44	1819·59
	„ Rock, N.L.	64 48	1800·61
	„ Stone, foot of Telegraph Post, S.L...	66 00	1748·25
	„ Granite rock, N.L....	67 00	1695·53
	„ Small Stone on L.	69 31	1655·63
	„ Rock, S.L.	70 75	1639·76

List of Bench Marks, Gudduk to Bellary—continued.

No.	Description.	Near.	Reduced.
		M. Chs.	Level.
	On Station peg, S.L.	71 60	1631·41
	„ „ „ S.L.	73 10	1613·79
	„ Stone, S.L.	74 06	1620·29
	„ Babool Tree, N.L.	77 60	1612·85
	„ Stone S.L.	78 63	1622·92
	„ „ S.L.	80 24	1659·21
	„ „ N.L.	81 22	1647·43
	„ „ S.L.	82 62	1653·73
	„ „ N.L.	85 20	1642·38
	„ „ N.L.	86 52	1611·55
	„ „ N.L.	88 13	1591·15
	„ „ N.L.	89 05	1589·09
	„ „ N.L.	90 02	1601·86
	„ Corner of Mainwaring Tank at Bellary	...	1586·49

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REPORT ON PROPOSED EXTENSION OF THE CARWAR LINE FROM GUDDUK TO BELLARY.

The Bellary extension starts from the Carwar and Gudduk line at 143 Ms., 40Chs., hard by the road that connects Gudduk and Betgaree, and proceeds for about 9 miles nearly due east as far as Hurlapoor. At Hurlapoor it takes some southing and runs into Copal—mileage 35 Ms., 20 Chs.—entering the Nizam's dominions at 15Ms., 26 Chs., about 3 miles to the west of a village called Bunnikopoo. From Copal, for about 6 miles, the line then keeps due east, so as to avoid a range of hills that trends to the Toongabuddra, and having flanked these hills, turns south east to Hooligee on the Toongabuddra, which is the boundary of H. H. Nizam's dominions. The line thus lies for 27 miles in foreign territory. From the Toongabuddra the direction generally continues south-east, and passing through Chitwaddy, a rich and populous village, whose wealth consists in the possession of a belt of irrigated land on the Toongabuddra, leaves Hospett, about 1 mile to the south, and passing by the Anuntstain temple, follows the Bellary road through a valley, as far as the Kooreekompi river. The line then leaves the road, winds by the foot of the Darojee tank, and, running north for about two miles, crosses the Bellary and Darojee road; and, again taking a south-easterly direction, passes by Timapoor and Veerapoor, and, keeping between two small granite hills to the north of Bellary, entirely misses the cantonment, and makes a junction with the Madras line at the Bellary station. The question of the point of junction with the Madras line is considered in another portion of this report.

The route above mentioned is nearly identical with that described in Colonel Hancock's memorandum.

The distance thus traversed is 91¼ miles, and the line lies within the territories of three separate Governments; for, passing out of the Bombay Presidency, it enters the Nizam's dominions, and, after crossing the Toongabuddra, falls within the range of the Madras Government. The natural peculiarities of the country are few—the most noticeable being the islets of variously coloured granite rocks that crop up from the surrounding plain, and the fringe of date palms bordering the streams. On these plains the eye is seldom relieved by the sight of the evergreen mango or tamarind grove, but a few babool trees and milkbushes break the line of the horizon.

The character of the cultivation, and of the crops, of course, depends on the nature of the soil. For the first four miles the soil is red and gravelly, and produces little but jowaree; for the next twenty-two, the country is a rich black soil, varying from 2′ 6″ to 5′ 0″ in depth, growing cotton, flax, wheat, pulses, and oilseeds, under a rotation of crops. From thence to the Toongabuddra, for 23 miles (with the exception of a width of ½ a mile on the banks of the Toongabuddra, irrigated from the river), the soil is principally a red sterile moorum, growing with difficulty a little jowaree, and a few castor-oil plants, but with occasional strips of black soil in the bottom near the rivers.

On the Madras side of the Toongabuddra, the line crosses a highly cultivated district which extends for three miles from the banks of the river.

The cultivation is wet, and the fertility of the soil depends on irrigation works, constructed some distance up the river. The ground is cropped with rice, sugar-cane, ginger, saffron, and pulses; and also carries cocoanut, banana, and soopari trees. Every square yard is under cultivation, the crops are finer, and the condition of the inhabitants better than any I have seen in India.

In grading the line here, my object has been to keep as low as possible without interfering with the irrigation. I have, accordingly, in the gradients, generally followed the inclination of the ground, keeping about 2′ 0″ or 2′ 6″ in bank, which allows, with girders and open culverts, sufficient headway for the

water in the irrigation channels. I have not interfered with a single irrigation channel, and the lowness of the bank will enable us to take up a minimum of land for the purpose of construction. In fact not more than ¾ a chain in width, or 6 acres per mile, will be required for the location of the line, and construction from side cutting. The side cutting must be so arranged as to stop short of the irrigation channels.

It would not have been difficult here, to have proposed a project involving heavy works and an entirely new system of scientific irrigation; but, as the present system works well and has enriched the cultivators, who have the character of being exceedingly litigious, I have thought it better to leave the irrigation as it is now, making as few alterations and causing as little disturbance of vested rights as was possible.

Most of the sugar-cane here grown is converted into sugar at Chitwaddy, and the pans in which the cane juice is boiled are of local manufacture; the iron, which is extremely malleable, is obtained from an ironstone found in large quantities at Ramandroog, a hill station about 12 miles off. Mr. Conder informs me that the ironstone is smelted in earthen furnaces, a layer of ironstone alternating with one of charcoal, and the only blast used is the common smith's bellows. Nearly all the iron used in this district for agricultural purposes is thus obtained.

After leaving Chitwaddy a comparatively barren country is entered, and we ascend the valley of Sondoo, at the mouth of which, about a mile to the south of the line, lies Hospett, a town said to contain 7,000 inhabitants. I may here remark that an appendix is attached to this report, showing the towns and villages passed through, with their population, the labour and carriage obtainable, depth of wells, and a variety of useful information, collected by Mr. C. Brereton, Assistant Engineer.

The inhabitants of this valley are chiefly occupied in pastoral pursuits. They are extensive graziers, and possess large herds of goats and sheep which supply the markets of Hospett and Bellary. The wool is woven into a rough kind of blanket, used by the natives as a cloak: cartloads of these are annually exported to Canara, where they are in great request on account of their stoutness.

For about 12 miles the cultivation is sparse, the soil a red hungry gravel with occasional patches of blacksoil, but the country is well watered by the numerous streams that take their rise in the neighbouring hills. Near Gadiganoor we come on some fields, or more properly gardens, irrigated by wells, that grow some of the commoner vegetables, but it is not till we have turned round the Darojee tank, which irrigates about 600 acres of land to the north, that we reach the wide expanse of blacksoil plain in which Bellary stands.

Note.—10 carts a day are said to leave Gadiganoor for Bellary with vegetables and firewood obtained from the Babool, which is here plentiful.

This plain is cropped with the usual staples grown on blacksoil, and the cultivation is somewhat assisted by a certain amount of irrigation from tanks which principally depend for their supply of water on the local rains.

The extensive system of irrigation projected from the Toongabuddra, by the Madras Irrigation Company, has not yet been carried out, though the country has been surveyed and plans prepared. Water here is very scarce; the wells average in depth 40 feet, and most of them cannot be used for drinking, owing to the brackishness of the water.

The soil is strongly impregnated with salt, and from it, in the villages adjacent to Bellary, a rude manufacture of this article is carried on. The brackishness of the water about Bellary necessitates the Madras Railway Company bringing up the supply for their engines from the Huggry river, about 10 miles off.

I have thought it advisable to divide the line into two districts. District

No. 1 ends close to the Toongabuddra. District No. 2 includes the Toongabuddra and ends at Bellary. I have taken Carwar and Madras as the two ports at which materials from England should be delivered—materials for No. 1 to be delivered at Carwar, for No. 2 at Madras. I think the advantage of this is evident; for, independent of the gain of drawing materials from two depôts, by utilizing the Madras railway, the cost of a ton of materials delivered on No. 2 is Rs. 24 or 43, according to the class of materials carried, as against Rs. 63 on No. 1. On the face of this saving I should have been inclined to have had all materials from England delivered at Madras, notwithstanding the advantage to be derived from two depôts, had it not been for the difficulties involved in crossing the Toongabuddra.

The Toongabuddra cannot be rendered passable for carts under a large outlay; the crossing would have annually to be renewed after the rains, and it would not be prudent to commence this annual reconstruction before November. The nearest ford is 25 miles upstream at Humpasagra, and to deliver materials to the nearest point on No. 1, would involve a *detour* of 48 miles.

I do not expect sleepers on No. 2 will be supplied under Rs. 2-8-0. The only available forests are in Canara. Instead of sending the sleepers to Gudduk, and thence along the line over the Toongabuddra to No. 2, I believe it will be found more advantageous to float them down the Toongabuddra from the Canara forests. A considerable quantity of timber is thus annually brought to Hospett. The price of teak timber I have not been able to learn, but that of jungle timber is Rs. 1-4-0 per cubic foot, thus floated.

In the detailed estimates for Permanent way and Bridge work, I have put the carriage by road, from Carwar to the Toongabuddra, at annas 6 per ton per mile, and from Bellary to the Toongabuddra at annas 4 per ton per mile. This rate for cart hire from Carwar, as compared with the rate from Bellary, seems high, but it must be considered that carts are only procurable at Carwar during the cotton season on their return to the cotton districts, that the supply is, consequently, fluctuating, and that though the road is good as far as Gudduk, yet the Arbyle ghat has to be ascended, and the road from the railway at Bellary is a made road, bridged, and far superior to the country roads from Gudduk; moreover, the proportion of 6 annas to 4 is the ratio that exists in the hire of carriage between the Dharwar and Bellary districts.

I have used rubble in the abutments and wingwalls of the minor bridges, with ashlar stones underneath the girders. In the large bridges, over the Copal nullah and the Toongabuddra, I have used coursed rubble throughout, with 3 courses of blocking under the girders. The small height of bank (a table showing the height of bank is attached to each separate Bridge Estimate) will, I think, allow of rubble in the minor bridges being adopted with safety. All stations and culverts are also estimated to be built in rubble. This rubble is an exceedingly flat-bedded granite.

In estimating for culverts I have taken them at a fixed price the yard run, so much being added for the faces, which are a constant quantity, and have been reduced into yards run of culvert.

The banks will have principally to be constructed from side cutting, and in building these banks on blacksoil I would recommend that the side cuttings should not be taken out continuously, with an idea of forming side ditches to the line, but that the earth for the banks should be taken out from side pits at least 100 feet apart, and that the position of these pits be so selected as not to interfere with the culverts. Where the system of side cutting in blacksoil has been adopted so as to make the side cuttings serve for side trenches, without any reference to the position of the culverts, I have seen these cuttings turned into nullahs, the cess gradually fretting away, the culverts rendered useless and each rainy season further developing the mischief, until the safety of the bank has been endangered, and expensive remedial measures have had to be adopted. For

the extra lead, thus necessitated in procuring earth for the banks, I have added ½ anna per yard on the earthwork.

It will be seen from the drawings, which are framed on the type designs for State Railways, that I have adopted generally girders in preference to arches. My experience of arches in India leads me to believe, that it is advisable to adopt the best class of work procurable; and I do not think that arches with summered stones can be built from the granite of the district under Rs. 1-8-0 per foot cubic.

The employment of girders also reduces the height of banks, gives more headway, and affords greater facilities for passing traffic under the line.

As to the comparative durability of iron and stone we have no well recorded statistics of the life of a girder; but it is an ascertained fact that arches built of the best material and workmanship do fail on railways from the constant pounding to which they are subjected, though an arch of the same description on a road may be considered imperishable.

On the other hand girders under locomotive traffic have a tendency to split high abutments and piers, which is not the case with arches; but as the height of the bridges is small, I do not think this danger need be apprehended

In grading this line my object has been to get as light work as possible with a ruling gradient of in 100, and yet to be safe from the floods. With 1 in 100, as a ruling gradient, it would have been possible to have had a surface line over a great extent of the country, and to have materially reduced the work, had the elements of floods been omitted. Thus on the blacksoil plain, extending about 4 miles from Gudduk to 25 on the section, and on the plain in which Bellary itself stands, the line could have been made a surface line, but if the country is examined attentively, there are indications of great rushes of water, though there are but few well defined streams. The waterways I have allowed average 80 feet lineal per mile.

As a case in point I may mention what happened in my own experience on 5 miles of the G. I. P. Railway. The country over which the line here ran was an undulating blacksoil plain, and in its features not unlike those I have just mentioned. There was only one well defined nullah but three times was this portion of the line washed away. It had originally been graded as a surface line with the hope of saving work, and the original error of attempting to save work by grading too near the surface was twice repeated. Three times the banks had to be lifted, and the last time at a great inconvenience, for engines were then running with ballast and materials.

I have been liberal in the use of level crossings—separation of property in India causes more inconvenience than is generally supposed—and the speed of the trains being limited to 15 miles per hour reduces the danger that is generally supposed to attach to their use.

In all cases where the road is turned under a bridge over a stream I would recommend curtain walls to be put in, and the space between the abutments and wings pitched. Through the neglect of this precaution very serious damage often results to a bridge. The carts cut up the ground, a rush of water comes and gets at the foundations. This may not happen the first, the second, or the third year, but it is sure to occur eventually wherever the road is turned under a bridge over a nullah, and where the bridge is not protected by curtain walls and pitching.

The only two bridges of magnitude on the line are those over the Bhurra nullah at Copal and the Toongabuddra at Hooligi.

The former consists of 10 spans of 60 feet each, with plate girders and rests on wells on a rock foundation.

The Toongabuddra is an important structure; it has 28 spans of 82 feet

each. The girders are Warren with the roadway on the top, the piers rest on rock foundations, and are designed to be built of coursed rubble with three courses of blocking in the foundations and the same number under the girders each course to be 1′ 0″ in depth.

The Burra nullah drains an area of 530 square miles. Its discharge in cubic feet per second at highest known flood is 70·143 cubic feet and the mean velocity is 12·5. The theoretical area required for the discharge is, therefore, 5,611 square feet—I have allowed 5,230 up to flood line, and have kept the bottom of girders 6′ 0″ above this.

The foundations of this bridge vary from 10 to 19 feet in depth. Immediately overlying the rock and below the sand, the borings show a stratum of stiff clay, about 18 inches in depth. This clay would undoubtedly make a firstrate bed into which to drive the piles, and would prevent the water rising from below, a difficulty that always occurs, when piling is driven through sand on the top of rock, for the unevenness of the rocks prevents a tight joint being made between the piles and the foundation. But taking into consideration the length of piling that would be necessary, the distance from which timber would have to come, and the great likelihood that a steam engine with powerful pumps would be required to keep the water down, I have thought it advisable to use wells.

The fact, too, that probably no other bridge on the line will require an engine, has influenced me; for it would add considerably to the expense of these foundations to debit them entirely with the cost of an engine, and in addition to the engines, first cost, skilled labour would be required for its management, fuel would be dear and difficult to procure, and the conveyance from Carwar would be a work of trouble and expense, and would involve the strengthening of some of the road bridges. Excellent laminated granite is found within a mile of the bridge.

The head waters of the Toongabuddra rise in Canara, and the drainage area, for which provision has to be made, extends over 10,650 square miles. For some distance below, and for about 2 miles above bridge, the river is a succession of rapids, advantage of which is taken for irrigation. The theoretical area required for the discharge at highest flood is 32,570 square feet. The area provided to floodline is 31,503. The lowest part of the girders is 6′ 0″ above highest known flood level, and this distance has been kept in all bridges on the line except at Koorcekompa, where the 6′ 0″ is reduced to 4′ 9″. But as the railway bridge is alongside the road bridge, which has stood for years, as I have used girders where the road bridge has arches, and as I have given 94′ 0″ more feet of lineal waterway, I think no danger need be apprehended.

The foundations of the Toongabuddra bridge are on rock. On the Bombay side of the river there is a large mass of boulders which will have to be removed. Blasting will quickly effect this. Huge masses of sheet rock are scattered over the river—some of them rather shaken; but, I anticipate little difficulty in securing a sound foundation at a slight depth The sandy spits and islets shown on the plan overly a bed of rock. I think there will be no necessity to employ a pumping engine. The river is here cut up into numerous small channels—many of them partially dammed with boulders; and it will not be difficult to divert the water from one channel into another as occasion requires. Many of the foundations can be got in without these diversions, as the piers will stand on rock above the ordinary level of the water. A plan and section to a large scale of the crossing accompany the report. In foundations of this description it would be difficult to take measurements by which contractors could be paid with accuracy. I have, therefore, added Rs. 2 per yard on the masonry to cover all expenses of founding.

A careful examination was made of the river before the site of the bridge was selected, and, I think, the best one has been got. The highest flood level obtained by the engineers employed here coincides with that given by Colonel Hancock. Stone abounds near the site of the bridge.

The following is a summary of the estimate. Length of line 91¼ miles, to end of proposed Station yard, Bellary and Gudduk extension.

ABSTRACT OF COST.

Distance 91¼ miles.

	Total cost.			Cost per mile.		
	Rs.	a.	p.	Rs.	a.	p.
Earthwork	3,03,274	10	0	3,323	0	0
Bridges and culverts	8,87,833	0	0	9,730	0	0
Protection to bridges (Pitching and Fender walls)	12,885	0	0	141	0	0
Ballast in main line	1,79,685	0	0	1,968	0	0
Permanent way main line	19,95,553	2	0	21,868	0	0
Level crossings	71,825	0	0	787	0	0
Fencing	49,476	4	0	542	0	0
Stations including permanent way and ballast in sidings	4,38,237	0	0	4,802	0	0
Staff Quarters	62,000	0	0	679	0	0
Electric Telegraph	91,250	0	0	1,000	0	0
Land	1,09,400	0	0	1,199	0	0
	42,01,419	0	0	.....		
Superintendence @ 10 %	4,20,142	0	0	4,604	0	0
Contingencies @ 10 %	4,20,142	0	0	4,604	0	0
	50,41,703	0	0	55,247	0	0
Cost of Junction Siding	64,671	4	0			
Grand Total ...	51,06,374	4	0			

The quantity of iron required in the construction of the line is—

	Tons.
for permanent way in main line	6,631
for stations including sidings	753·47
for fencing including gates to level crossings, and guard rails	288·16
for bridge work	1,207
	6,879·63

The estimate for rails and plate girders has been framed from prices at which these articles were supplied in England, in May of this year, to Indian State Railways.

	£	s.	d.	
Rails	12	12	6	per ton.
Fish plates	11	0	0	,,
Fish bolts and nuts	20	10	0	,,
Fang bolts	18	0	0	,,
Spikes	16	0	0	,,
Plate girders	11	10	0	,,

I have taken freight at £ 3-10 per ton, and have added 5 per cent. for landing

charges, 5 per cent. for insurance, and also 5 per cent. for loss of material in permanent way. No information was available of the rate at which Warren girders were supplied in England, but I have taken £ 20 per ton as a fair price which with freight at £ 3-10-0 per ton, and 5 per cent. for each of the items of insurance and landing makes their delivery in India £ 25-10 per ton.

The local rate for earthwork seems to be about 2½ annas per yard. I have allowed 4½ and 4 for banks and cuttings respectively. The extra price for banks is given for the lead involved in making the banks from side cuttings which should not be less than 100 feet apart. The difference between 2½ annas and 4½ annas seems considerable, but it should be remembered that whilst the labourer gets paid his 2½ annas for every yard when deposited, the contractor has to find superintendence, set out his work, keep it in good shape, and repair the waste caused by the rains—a heavy item on new made banks in a black soil country.

Rubble masonry I have entered at Rs. 9 per yard, and have allowed one rupee more in stations, on account of the height and thinness of the walls. Material in the shape of an excellent building granite is abundant. In these districts I heard of rubble work being done at Rs. 5 per yard but on no extensive scale, and I think that Rs. 8-8-0 per yard, which was, I believe, the cost of this description of work executed by the Madras Railway Company, nearer the mark. The conditions of the cost of building vary but slightly throughout the line.

Coursed rubble is taken at Rs. 14 per yard. The prices at which this work has been done on the G. I. P. Railway with the same class of stone, and under nearly the same circumstances as regards lead, show the rate to be a fair one.

Blocking course at Rs. 1 and Ashlar at Rs. 1-8-1 per cubic foot, are good prices.

I have been liberal in my rates for foundations for bridges, and have allowed a rupee per cubic yard, whether the foundations are wet or dry. In giving this rate it should be stipulated, that the contractors should only be paid for a width equal to the dimensions of the masonry plus 6″ on each side of the footings. This stipulation renders contractors careful in taking out their foundations as near the size of the masonry as possible, a point that should not be disregarded in construction. A liberal price too in foundations will generally ensure the work being carried down to a good bottom, and save much unpleasantness between the Engineers and Contractors.

Where the line runs over black soil, ballast is scarce; some can be obtained from the nullahs, but the quantity will have to be supplemented by broken stones.

On other portions ballast will be procured without much trouble. The rate of one rupee a yard, fixed from a consideration of these points, is, I think, sufficient.

Teak sleepers have been taken at Rs. 2 each on No. 1 district. As the Conservator of Forest in Canara has offered to deliver teak sleepers at Gudduk, at Rs. 1-8 each, an extra eight annas is added on each sleeper for carriage which is ample, as the mean lead between Gudduk and the Toongabuddra is not 25 miles, and the weight of each sleeper is 56 lbs. As previously stated in this report, I do not think sleepers will be delivered on No. 2 district under Rs. 2-8-0.

The irrigated land on the eastside of the Toongabuddra has been estimated for at Rs. 500 per acre, cropped land under dry cultivation at Rs. 100, and uncropped land at Rs. 50.

Diversions are supposed to go into bank. Consequently as they are paid for in bank they have not been entered separately in the estimates.

Bellary is one of the most important stations in the Madras Presidency. It contains a population of 40,000 inhabitants, and is the centre of trade for the surrounding districts; it even influences the markets 100 miles to the west. Two mercantile firms have lately established cotton presses here, their agencies reach as far as Gudduk, and a considerable amount of cotton has been diverted

this year from the Dharwar Districts, and from what has hitherto been considered its legitimate destination, Bombay, to be pressed at Bellary for shipment to England *via* Madras.

In addition to its commercial element, Bellary has a military force consisting of the head quarters of the artillery for the ceded districts, a regiment of native cavalry, a European line regiment, and two line regiments of the native army. The cantonments are about two miles in length, and the civil station is also large.

The direction of the line into Bellary was fixed with a view of interfering as little as possible with the cantonment and civil station.

The line keeps on the north at the foot of a range of hills, that commands that side of the citadel, and misses the cantonments entirely. Some roads on the junction line between the Gudduk and Bellary station and the Madras Line, will require diverting and a level crossing, but no house property is touched. Had the line been kept on the south side of the citadel (though in this case, a better junction is obtainable with the Madras Line) there would have been great interference with house property and roads. Parade grounds, military buildings, and private dwellings, would have been cut up, and the narrow strip of land between the tank and fort, now occupied by the main road that leads from the camp and densely populated Cowl bazar to the civil station, must have been taken for the railway.

To obviate the road diversions and the level crossing I have just mentioned, I had a line run at the back of the Judge's house, joining the Madras Line below the Adoni road; but the gradients, both on the Madras Line and on the Bellary and Gudduk extension, were not such as to admit of a good station ground, and the distance of the point of junction, from the Madras Railway station and the city of Bellary, is considerable.

A reference to the plan, 4 chains to the inch, corresponding to the section, will elucidate these points.

It will be observed that the station of the Gudduk and Bellary extension is located about one mile from the Madras Railway, and is connected with it by a continuation of the main line laid with the double gauge. The situation of the Madras station is exceedingly good. The station is on the level, foundations are excellent, and the formation may be said to coincide with the surface of the ground; so that no heavy earthworks are required. In addition to the space at present occupied by their sidings, the Company have taken up ground towards the cemetery and Bank; the boundary walls of this additional land are marked on the plans, and the land thus taken up comprizes all that is really available for station purposes; for the ground begins to rise within the boundary walls on the side of the cemetery at 1 in 100, and falls on the side of the Bank, towards Madras, at the same rate.

Note.—This continuation of the main line makes distance from Gudduk to junction with Madras Line 92Ms., 16 Chs.

The rise of 1 in 100 on the side of the cemetery continues to within 6 chains of the end of the station yard proposed for the Gudduk and Bellary line.

This site was selected for the following reasons:—

1*st.*— The station ground is on the level, the earthworks are light, and good foundations are obtainable;

2*nd.*—The ground is not occupied with buildings, and its acquisition would be inexpensive, and

3*rd.*—The only other available ground for a station within a reasonable distance of the city is taken up by the Madras Railway Company.

The fact that the ground in question has been taken by the Madras Railway seems to prove that they calculate on additions to their station yard; and, though they may not require all they have taken, these additions would limit the space at the disposal of the Gudduk and Bellary extension. In the event of the development

of traffic, or even in first deciding what ground each railway should take, it would be difficult to assign to each railway the limits of their station yards. As possessors of the ground the Madras Railway would have the chief voice in this arrangement, and would naturally take care to protect what they consider their interests.

If, however, it could be so arranged that the details for the station yards of both railways and the management of traffic should be under one control—so that what are considered different interests should be made subservient to a well-considered scheme, framed to benefit the Public and both lines alike—it would then be a question whether the station for the Gudduk and Bellary extension, should not be transferred to the site partially occupied by the Madras Railway Company.

Should an arrangement to combine the station yards be possible, no passenger station and platform, goods shed, or latrines for the Bellary and Gudduk extension would be needed. The junction siding would not require to be laid with the mixed gauge; and the siding shown in blue on the broad gauge, together with the 14 feet turntable, could be dispensed with. It would be advisable to keep the rolling stock separate and thus a running and carriage shed and turntable would be wanted for the narrow-gauge line, and separate watering and fuel arrangements would also be desirable. I would keep the same extent of sidings, as at present shown, on the proposed station.

The approximate saving by combining the station yards would amount to Rs. 60,970-8-0.

Thus made out:—

	Rs.	a.	p.
Saving on junction and broad-gauge siding.	29,146	0	0
Do. on 14 feet turntable	1,718	8	0
Do. on latrines	1,012	0	0
Do. on passengers' platform.....	5,086	14	0
Do. on do. station	15,564	2	0
Do. on goods shed.....	8,443	0	0
Total saving Rs....	60,970	8	0

The mixed guage is estimated to be laid with outside rails 68 lbs. to the yard, the inner or 3rd rail being 40 lbs.

A table of rainfall for the last five years, the time for which records have been kept at Bellary and Hospett, is appended to the report, and the results, as tabulated, are as follows:—

	Bellary.			*Hospett.*		
Date.	Rainfall during 12 months.	Highest Rainfall in any one month.	Highest Rainfall in any 24 hours.	Rainfall during 12 months.	Highest Rainfall in any one month.	Highest Rainfall in any 24 hours.
1868... ...	23·69	September. 8·01	September 9th 3·00	28·72	September. 11·77	Sept. 11th. 3·00
1869... ...	13·02	August. 5·11	May 31st. 2·26	17·00	August. 6·90	June 1st. 2·70
1870... ...	15·54	June. 4·45	June 13th. 1·69	20·40	June. 6·65	June 6th. 2·90
1871... ...	18·35	September. 4·50	June 5th. 1·75	15·35	October. 3·80	Oct. 3rd. 2·30
1872... ...	15·80	September. 4·81	September 8th 1·50	44·23	October. 9·35	Oct. 9th. 4·30

It will thus be seen that the—

		Inches.
Highest rainfall at Bellary during 12 months was	.....	23·69
Minimum ,, ,, ,,	.....	13·02
Highest ,, at Hospet ,,	.....	44·23
Minimum ,, ,, ,,	.....	15·35

Highest rainfall at Bellary during any one month	Sept. 1868	...8·01
,, Hospet ,,	Sept. 1868	...11·77

		Inches.
Highest rainfall at Bellary during any 24 hours.	Sept. 9th 1868	...3·00
,, Hospett ,,	Oct. 9th 1872	...4·30

No record of rainfall could be obtained either at Gudduk or Copal.

In permanently staking the line some alterations should be made in the location. The chief alterations required are between the 11th and 25th miles, and between Copal and the Toongabudra. A long straight extends for nearly 15 miles and to obtain this straight, ground better adapted for the construction of a railway has been lost sight of. A reference to the plan will show that, between the points I have mentioned, the direction of the drainage of the country is continually varying from the north to the south of the line. Instead of one long straight across the country the line should be swept gently in and out, so as to take advantage of the different watersheds as far as possible; this would considerably lessen the water-way now allowed and diminish risk to the line from floods.

Judicious curving also between Copal and the Toongabudra will lighten the gradients.

The levels have been referred to Mr. Buchanan's datum which is 100 feet below mean sea level at Carwar, and start from the Pier head, the level of which, as given by Mr. Buchanan, is 108·00.

The levels thus starting from the Pier head at Carwar, and reduced to the mean sea level at that place, differ from the Madras Railway levels at Bellary by 2·25, and from the G.I.P.R. levels at Sholapúr by 1·30, referred respectively to mean sea level at Madras and Bombay.

But though 108·00 has been given as the level of Carwar Pier head to a datum 100 feet below mean sea level, I have not been able to find any mark defining mean sea level, nor has the Port Officer heard of one. I, therefore, think that the mean sea level at Carwar is simply an approximation; for to obtain mean sea level accurately is a work of time and delicacy, and after the labour involved in settling the point, it is but natural to suppose that the mean sea level would have been marked in some conspicuous position.

The line *vid* Dumul passes close by Moonderghee, a town of about the same size as Copul, and crosses the Toongabadra at a village called Kukoor, about a mile and a half up stream from the ferry boat established at Hessuroor, and 40 miles from the crossing on the direct line. The line then keeps close to the Toongabadra, crossing a number of important tributaries, and finally joins the direct route between Gudduk and Bellary at about 53½ miles close to the Hospett Station. The crossing at Kukoor is very good, the rock is exposed throughout the bed of the river, though at the abutment it underlies the surface at about a depth of 30 feet. The bridge would require about 16 openings of 82 feet spans as against 28 of the same span on the direct line. This alternative route, however, is 12 Ms. 78 Chs., or 13 miles longer than the line *vid* Copal.

Again, an inspection of the accompanying list of bridges on the two lines of 44 feet span and upwards (minor bridges, culverts, earthwork &c., keeping about the same relatively on both lines mile for mile), will show that the bridging on the Dumul line is considerably in excess of that due to the 13 extra miles of length. This excess amounts to Rs. 71,000, and the whole length of the line from Gudduk to Hospett by Dumul being 66 miles, the increase of the masonry may be taken at Rs. 1,080 per mile. Now the cost per mile on the direct route is Rs. 55,247 per mile, and adding one thousand and eighty rupees for increased bridge work the cost is brought up to Rs. 56,327, which multiplied by 13 gives ..... Rs. 7,32,251

Add for extra station 3 units	„	67,000
„ 1 unit	„	27,000
Total Rs.		8,26,251
Add 10 per cent contingencies		82,625
„ superintendence		82,625
	Rs.	9,91,501

The cost, therefore, of the alternative line by Dumul may be said to be £100,000 in excess of that *viâ* Copal.

List of Bridges 40 feet and upwards between Gudduk and Hospett, via Copal.

Names of Rivers.	Spans.	Depth from centre bed of river to formation.
		Feet.
Jowl nullah	1 40	16
Gúdi nullah	4 40	16
Yekee nullah	2 40	12
Hurlapoor nullah	2 40	15
Sindee nullah	5 40	13
Cantishmapa nullah	2 40	13
Copal nullah	10 60	21
At 38 ms. 54 chs.	3 40	12
At 48 ms. 76 chs	1 40	10
Toongabudra river	28 82	32
Irrigation channel at 52 ms. 42 chs.	1 40	9

List of Bridges 40 feet and upwards between Gudduk and Hospett, via Dumul and Hessuroor.

Names of Rivers.	Spans.	Depth from centre bed of river to formation.
		Feet.
Gadi nullah	3 40	16
At 8 ms. 73 chs.	1 40	16
At 11 Ms. 33 „	1 40	14
Dumul nullah	3 40	23
At 16 ms. 52 chs	1 40	18
Hurihuly nullah	5 60	20
Oor nullah	3 40	15
Dumor Gutic nullah	3 40	15
Ghin nullah	3 40	14
Toongabadra river	16 82	45
Tulwakee nullah	2 40	23
Luchmore nullah	2 40	20
Battee nullah	3 40	16
Culvey nullah	4 60	28
Gowry nullah	2 40	20
Wudguchee nullah	5 60	28
Buskood nullah	3 40	30
Yerree nullah	1 40	15
Hugree nullah	10 60	30
Bulahonchi nullah	3 60	32
Gowripoor nullah	4 40	17

I examined the Toongabadra attentively for a crossing in the neighbourhood of Hessuroor; the one selected at Kukoor is, I think, the best.

A crossing was proposed at Korunhully, about 5 miles up stream from Hessuroor, which I have had surveyed, and a plan of which accompanies the Report. The proposed crossing is simply a mass of rubble stone, evidently intended to form an anicut, and the original design has either failed or been abandoned.

Should the rubble be removed, so as to get at the underlying rock, the rock itself lies too obliquely to the course of the river to build on.

The Dumul route was surveyed with the intention of keeping the line entirely in British territory; but should H. H. the Nizam be inclined to follow the example of Holkar, and advance the money necessary for the construction of the 27 miles that lie within his dominions, independently of the advantage gained by a shortened and cheaper line, it would be to the interest of the State to construct the line by Copal.

Tabular Statement showing population, labour supply, &c., of Villages adjacent to the Gudduk and Bellary extension.

Names of Villages.	No. of Inhabitants.	No. of Coolies.	No. of Carts.	Depth of Wells.	Description of Stone.	Lead of Stone.	Lead of Lime.
				Feet.		Miles.	Miles.
Gudduk...	10,320	1,200	10	30	Granite.	2	2
Betgerry	8,716	900	...	38	...	1½	1
Huttigerry	300	65	9	46	...	0½	0½
Kurniala	1,700	400	12	58	...	8	3
Hullipoor	2,257	750	20	40	...	7	3
Timapoor	830	300	25	45	...	6	4
Bunnecopoo	1,700	530	18	26	...	4	2
Thalakulla	2,500	800	30	28	...	3	3
Banapoor	570	160	15	23	...	5	1
Duddigal	155	20	2	30	...	1	2
Hulligira	549	180	4	25	...	2	3
Copal	5,339	800	100	30	...	0½	1
Bassapore	505	200	10	27	...	2	2
Ginigerry	660	280	4	27	...	3	3
Canakapoor	144	30	2	25	...	2	3
Bevinhully	240	60	5	32	...	2	2
Hitnal	940	450	30	25	...	2	3
Hooligi	593	220	3	20	...	3	4
Hassoor...	230	50	4	10	...	1	4
Chitwady	4,000	550	60	10	...	2	4
Hospett...	7,000	1,000	100	35	...	1	3
Unchanagoody	270	45	5	32	...	...	...
Sunkalapoor	220	40	15	25	...	1½	2
Vodrully	150	30	12	26	...	1	2
Pakanakenully ...	200	30	10	29	...	2	3
Bylodigira	500	150	35	18	...	1	1
Kakball...	400	90	20	25	...	0½	0½
Goonglavadigira ...	450	100	25	45	...	0¼	2
Durmasager	640	200	40	24	...	1	1
Gadiganoor	1,200	240	30	29	...	1	0½
Boovanullee	70	10	5	32	...	1	1
Coricompee	800	270	10	30	...	1½	1½
Basapore	250	40	6	27	...	1	1
Toranagul	1,200	300	20	25	...	0¼	0½
Darojee	2,000	600	30	22	..	0½	0½
Timlapoor	200	30	...	20	...	0½	0½
Kurtani...	2,000	500	50	29	...	1½	2
Veerapoor	270	55	7	30	...	2	...
Collagul...	340	80	20	27	...	1	4
Ullipoor	300	60	40	35	...	2	0¼
Bellary	40,000	...	...	38	...	0½	4

RAINFALL Returns at Bellary and Hospett.

Months.	1868.			1869.			1870.			1871.			1872.		
	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.	Bellary.		Hospett.
	Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.		Kutcherry.	Fort Hospital.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
January	0·12	...	...	...	...	...	...	0·02	...	0·55	0·36	0·25	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	1·75	0·99	0·10	...	...	...	...	...	0·25	...	...	...	...	...	...
April	1·03	1·57	0·35	0·60	0·44	...	...	...	0·20	0·20	0·46	0·45	06·0	0·59	0·41
May	0·35	0·59	2·56	2·45	2·97	1·20	1·30	1·62	1·50	3·20	3·43	1·70	0·60	0·55	0·27
June	2·52	2·25	6·57	0·42	0·48	3·60	4·35	4·45	6·65	2·55	2·82	1·35	2·61	2·19	3·30
July	3·71	3·80	2·19	1·00	0·97	0·45	0·47	0·74	2·55	0·35	0·79	1·60	1·19	1·16	8·80
August...	3·92	3·93	3·08	6·15	5·11	6·90	2·90	2·70	3·10	1·20	1·62	3·45	0·45	0·54	11·35
September	6·42	8·01	11·77	2·00	2·11	1·80	1·95	1·95	0·85	3·97	4·50	2·50	5·72	4·81	8·10
October	2·42	2·08	2·10	1·97	0·87	2·75	3·40	3·13	4·50	2·00	1·75	3·80	5·42	5·04	9·35
November	0·50	0·47	...	...	0·07	0·30	0·60	0·93	0·80	2·15	2·62	0·25	0·87	0·74	...
December	...	...	...	0·10	...	...	...	...	...	...	...	...	0·60	0·18	2·65
Total ...	22·74	23·69	28·72	14·69	13,02	17·00	14·97	15·54	20·40	16·17	18·35	15·35	18·06	15·80	44·23

Greatest Rainfall for 24 hours from 1868 to 1872 at Bellary and Hospett.

	1868.			1869.			1870.			1871.			1872.		
	The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.			The greatest rainfall during any 24 hours in a month.		
	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospitall.	Hospett.	Cutcherry.	Fort Hospital.	Hospett.	Cutcherry.	Fort Hospital.	Hospett
January	29th 0·12	.....	...	.....	.....	.....	.....	19th 0·02	...	17th 0·30	16-& 18th 0·18	17th 0·25	.....	.....	...
February	..... 28th	..... 28th	... 31st	.....	.....	.....	.....	.....	... 21st	.....	.....	...	.....	.....	...
March	1·50 3rd	0·72 3rd	0·10 11ht	..... 27th	..... 27th	.....	.....	.....	0·25 20th	..... 21th	..... 21th	... 20th	..... 19th	..... 19th	... 5th&14th
April	0·60 6th	0·68 6th	0·25 30st	0·55 31st	0·36 31st	..... 7th	..... 7th	..... 28th	0·20 8th	0·20 26th	0·45 26th	0·30 8th	0·60 2nd	0·45 2nd	0·20 2nd
May	0·26 5th	0·46 5th	0·70 3rd	2·00 17th	2·26 17th	1·00 1st	0·80 13th	0·35 13th	0·55 6th	1·00 5th	1·02 5th	0·70 2nd	0·45 7th	0·46 7th	0·27 20th
June	1·80 8th	1·52 8th	19·2 22nd	0·32 31st	0·36 31st	2·70 20th	1·92 4th	1·69 4th	2·90 10th	1·70 11th	1·75 18th	0·65 11th	1·10 16th	0·95 16th	0·80 16th
July	1·57 2nd	1·52 2nd	0·67 2nd	1·00 16th	0·86 16th	0·15 28th	0·32 11th	0·34 11th	0·60 20th	0·30 29th	0·20 30th	0·50 29th	0·62 23rd	0·40 23rd	3·40 7th
August...	2·50 10th	2·35 9th	0·50 11th	1·90 14th	1·22 30th	2·00 29 th&t h	2·00 3rd	1·40 3rd	0·80 15th	1·00 27th	0·83 28th	1·35 5th	0·22 8th	0·26 8th	2·40 30th
September	1·90 15th	3·00 15th	3·00 7th	0·70 24th	0·58 27th	0·80 2nd&5th	1·55 20th	1·38 2nd	0·35 4th	1·60 19th	1·74 19th	0·80 3rd	1·90 9th	1·50 10th	1·30 9th
October	0·80 2nd	0·77 2nd	1·50	0·70	0·60 1st	0·65 1st	0·90 16th	0·61 16th	2·00 3rd&4th	0·87 14th	0·60 14th	2·30 8th	1·40 15th	1·50 15th	4·30
November	0·50	0·47	...	..... 16″0	0·04	0·30	0·60	0·55	0·40	1·15	1·25	0·15	0·62 9th	0·42 11th	... 9th
December	.....	.....	...	0·10	.....	.....	.....	.....	...	.....	.....	...	0·25	0·08	1·00

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate cost of Way and Works for 48 miles 76 chains (for details see separate Estimate).

Description of Works.	Quantities.	Rate.	Per.	Amount. Indian.	Amount. English.
		Rs. a. p.		Rs. a. p.	Rs. a. p.
Earthwork including trimming of slopes as specified in line embankment	436,920	0 4 6	C. yard ...	1,22,883 12 0	
Ditto. in cutting ...	94,883	0 4 0	„ ...	23,720 12 0	
Earthwork excavation in foundations of bridges	7,782	1 0 0	„ ...	7,782 0 0	
Ballast for main line laid and trimmed	96,522	1 0 0	„ ...	96,522 0 0	
Teak timber in bed plates and packings of bridges fixed in place, inclusive of fastening	911	4 0 0	C. feet ...	3,644 0 0	
Wrought iron in plate girders ...	354·75	227 0 0	Tons	...	80,528 4 0
Fixing same	354·75	40 0 0	Tons	14,190 0 0	
Carriage of bridge material from Carwar, mean lead 168 miles, at 6 annas per ton per mile	194·75	63 0 0	...	12,269 4 0	
Carriage of bridge material from Carwar to Bhurra Nullah, 176 miles, at 6 annas per ton per mile ...	160	66 0 0	...	10,560 0 0	
Permanent way for main line ...	48·95	13,286 0 0	Mile ...	...	6,50,349 12 0
Carriage of permanent way from Carwar, average lead 168 miles ...	3,562	0 6 0	Ton per mile	2,24,406 0 0	
Laying of permanent way in main line as specified	86,152	0 8 0	Yard ...	43,076 0 0	
Teakwood sleepers in main line exclusive of stations...	97,900	2 0 0	Each ...	1,95,800 0 0	
Level crossings with gate lodges ...	10	1,920 0 0	„ ...	19,200 0 0	
Ditto. without	25	880 0 0	„ ...	22,000 0 0	
Fencing Complete	Miles 10	...	...	10,940 0 0	16,333 2 0
Culverts (*See* List)	...	...	...	33,372 8 0	
Rubble masonry in bridges	10,087	9 0 0	C. yard ...	90,783 0 0	
Coursed rubble in do.	1,188	14 0 0	„ ...	16,632 0 0	
Block in course in do.	2,394	1 0 0	C. feet ...	2,394 0 0	
Ashlar in copings, caps, bed stones, and springers	9,609	1 8 0	„ ...	14,413 8 0	
Brickworks in wells including curbs.	430	12 0 0	C. yard ...	5,160 0 0	
Sinking wells	1,039	5 0 0	Lin. feet ...	5,195 0 0	
Concrete in wells	483	5 0 0	C. yard ...	2,415 0 0	
6″ cover stones for wells	35	50 0 0	Squares ...	1,750 0 0	
Pitching for bridges	1,694	3 0 0	S. yard ...	5,082 0 0	
Curtain walls for bridges	552	9 0 0	C. yard ...	4,968 0 0	
Land	420	100 0 0	Acre ...	42,000 0 0	
Do.	168	50 0 0	„ ...	8,400 0 0	
Stations.					
Hurlapoor (one unit)	...	...	...	17,512 10 0	9,216 10 0
Tullacul (one unit)	...	...	...	17,303 10 0	9,216 10 0
Copal (three units)	...	...	...	48,952 0 0	18,199 0 0
Assistant Engineer's house	1	8,000 0 0	Each ...	8,000 0 0	
Permanent way Inspectors	2	2,500 0 0	„ ...	5,000 0 0	
Electric Telegraph	48·95	1,000 0 0	Mile ...	17,132 8 0	31,817 8 0
Total.....	...	...	...	11,53,459 8 0	8,15,660 14 0

Total Cost ... ... Rs. 19,69,120
Add for Contingencies 10 per cent. 1,96,912
„ „ Superintendence 10 per cent. 1,96,912

Total ... Rs. 23,62,944

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Abstract of Quantities in Embankments.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	1,39,901	Brought over ...	2,88,502
1	368	19	295	37	10,963
2	754	20	12,099	38	845
3	1,545	21	7,228	39	296
4	3,052	22	7,898	40	2,254
5	13,768	23	12,041	41	6,466
6	26,118	24	4,636	42	25,954
7	15,822	25	26,024	43	9,886
8	1,860	26	5,513	44	1,712
9	1,233	27	3,678	45	11,228
10	7,153	28	16,405	46	12,337
11	35,257	29	6,500	47	34,558
12	24,122	30	21,569	48	14,212
13	103	31	2,363	49	2,287
14	5,245	32	1,162	50	1,770
15	142	33	341	51	968
16	342	34	15,767	52	6,195
17	103	35	4,245	53	1,408
18	2,914	36	837	54	5,079
Carried over.	1,39,901	Carried over.	2,88,502	Total C. yards.	4.36,920

Abstract of Quantities in Cutting.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	24,269	Brought over ...	51,385
1	1,471	19	1,118	37	1,767
2	347	20	355	38	1,365
3	139	21	304	39	589
4	846	22	862	40	262
5	1,175	23	600	41	1,538
6	13,874	24	759	42	1,050
7	106	25	430	43	4,937
8	213	26	430	44	803
9	361	27	213	45	6,556
10	216	28	275	46	1,866
11	2,357	29	6,531	47	1,082
12	781	30	4,633	48	1,403
13	1,433	31	4,127	49	455
14	170	32	1,523	50	4,212
15	170	33	381	51	6,027
16	132	34	690	52	3,283
17	84	35	2,519	53	5,403
18	394	36	1,366	54	900
Carried over.	24,269	Carried over.	51,385	Total C. yards.	94,883

CARWAR STATE RAILWAY.

GUDDUK TO TOONGABUDDRA RIVER.

District No. 1.

Quantities in Bridges.

Mileage.		Openings.	Foundations.	Rubble Masonry.	Ashlar.	Timber.	Amount.	Iron-work.	Amount.	Total amount.	Remarks.	Depth of Bank, Feet.
M.	Chs.	Feet.	C. yds.	C. yds.	C. ft.	C. ft.	Rs. a. p.	Tons.	Rs. a. p.	Rs. a. p.		
0	43	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		7
0	74	Two 20	219	314	236	20	3,479 0 0	4·50	1,485 0 0	4,964 0 0		10
1	33	One 40	267	336	206	10	3,640 0 0	6·25	2,062 8 0	5,702 8 0		16
2	76	Four 40	501	558	441	40	6,344 8 0	25·00	8,250 0 0	14,594 8 0		14
4	29	Two 40	166	226	216	20	2,604 0 0	12·50	4,125 0 0	6,729 0 0		9
4	46	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		8
7	39	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		13
8	78	Two 40	325	416	293	20	4,588 8 0	12·50	4,125 0 0	8,713 8 0		15
9	11	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		9
9	35	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
10	30	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
12	40	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
13	21	One 12	132	214	137	5	2,283 8 0	1·25	412 8 0	2,696 0 0		11
15	02	One 12	134	176	138	5	1,945 0 0	1·25	412 8 0	2,357 8 0		8
15	24	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
16	65	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		10
17	55	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
20	15	Two 12	231	355	226	10	3,805 0 0	2·50	825 0 0	4,630 0 0		13
20	40	Two 12	231	355	226	10	3,805 0 0	2·50	825 0 0	4,630 0 0		12
24	00	Three 12	202	266	273	15	3,065 8 0	3·75	1,237 8 0	4,303 0 0		9
25	24	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		11
26	77	Two 20	219	314	236	20	3,479 0 0	4·50	1,485 0 0	4,964 0 0		11
28	46	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
30	70	Five 40	298	393	489	50	4,768 8 0	31·25	10,312 8 0	15,081 0 0		9
32	02	Two 40	120	267	235	20	2,955 8 0	12·50	4,125 0 0	7,080 8 0		10
33	67	Ten 60	...	...	...	...	...	...	...	...	*See* Special Estimate.	12
34	03	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
35	22	One 20	179	258	157	10	2,776 8 0	2·25	742 8 0	3,519 0 0		7
38	54	Three 40	428	453	354	30	5,156 0 0	18·75	6,187 8 0	11,343 8 0		13
40	12	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
40	42	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		9
41	31	One 12	132	180	137	5	1,977 8 0	1·25	412 8 0	2,390 0 0		8
42	72	Three 12	202	266	273	15	3,065 8 0	3·75	1,237 8 0	4,303 0 0		8
43	64	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
44	06	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
44	72	Three 20	259	370	315	30	4,181 8 0	6·75	2,227 8 0	6,409 0 0		8
45	08	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		6
45	65	Two 12	169	213	206	10	2,435 0 0	2·50	825 0 0	3,260 0 0		7
46	61	One 12	134	176	138	5	1,945 0 0	1·25	412 8 0	2,357 8 0		6
47	67	Two 12	167	223	205	10	2,521 8 0	2·50	825 0 0	3,346 8 0		8
			7,524	10,087	8,213	505	1,12,646 8 0	194·75	64,267 8 0	1,76,914 0 0		

Schedule of Rates.

Excavation	Rs.	1	per C. yard.
Rubble Masonry.	„	9	„ „
Ashlar	„	1/8	„ C. Feet.
Timber	„	4	„ „
Ironwork	„	330	„ Ton.

Summary.

				Rs.	a. p.
Excavation	7,524	C. yard	at Rs. 1	7,524	0 0
Rubble Masonry.	10,087	„	„ „ 9	90,783	0 0
Ashlar	8,213	C. Feet	„ „ 1/8	12,319	8 0
Timber	505	„	„ „ 4	2,020	0 0
Ironwork	194¾	Tons	„ „ 330	64,267	8 0
				1,76,914	0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Details of cost of Ironwork in Girders.

Cost per Ton.	English. £. s. d.	English. Rs. a. p.	Indian. Rs. a. p.
Cost in England	17 10 0		
Insurance at 5 per cent...	0 17 6		
Landing charges, &c., at 5 per cent	0 17 6		
Freight to Carwar	3 10 0		
	22 15 0	say 227 0 0	
Carriage by road...	.....	.....	.....
Average lead 168 miles at 6 annas per ton per mile	.....	.....	63 0 0
Fixing Girders per ton	.....	.....	40 0 0
Total...	.....	227 0 0	103 0 0

Cost per Ton including Fixing Rs. 330
Length of District 49 Miles.
Average lead $\frac{49}{2}$ = 24½ „
Carwar to Gudduk = 143½ „
Total Lead... 168 „

Estimate of cost of Bridge over the Bhurra Nullah—Ten Spans of 60 Feet.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation to Foundations	258 C. yards.	1 0 0	258 0 0
Coursed Rubble	1,118 „	14 0 0	16,632 0 0
Block in course	2,394 C. feet.	1 0 0	2,394 0 0
Ashlar	1,396 „	1 8 0	2,094 0 0
Brick work in wells including curbs	430 C. yards.	12 0 0	5,160 0 0
Concrete filling wells	483 „	5 0 0	2,415 0 0
6″ Cover stones for wells...	35 Squares.	50 0 0	1,750 0 0
Pitching west abutment in mortar	18 Sq. yards.	3 0 0	54 0 0
Sinking wells	1,039 Linl. feet.	5 0 0	5,195 0 0
Timber	406 C. feet.	4 0 0	1,624 0 0
Ironwork in Girders including Fixing	160 Tons.	333 0 0	53,280 0 0
Total cost of Bridge...	...	...	90,856 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 1.

Details of cost of Ironwork in Girders for Bhurra Nullah.

Cost per Ton.	English.			Indian.
	£. s. d.	Rs. a. p.		Rs. a. p.
Cost in England	17 10 0			
Insurance at 5 per cent....	0 17 6			
Landing charges, &c., at 5 per cent.	0 17 6			
Freight to Carwar	3 10 0			
	22 15 0	Say 227 0 0		
Carriage by road, 176 miles, at Rs. 0-6-0 per mile.	...	.....		66 0 0
Fixing Girders	...	.....		40 0 0
Total...	...	227 0 0		106 0 0

Cost of Girders per ton Rs. 333.

CARWAR STATE RAILWAY.

GUDDUK TO THE TOONGABUDDRA RIVER.

District No. 1.

Quantities in Culverts.

Mileage. Miles.	Mileage. Chs	Openings.	Lineal yards.	Rate. Rs. a. p.	Amount. Rs. a. p.	Remarks.
0	15	5 Feet. ...	.....	...	395 0 0	Open.
1	24	5 „ ...	14·00	60 0 0	840 0 0	
3	42	3 „ ...	10·00	35 0 0	367 8 0	
4	08	5 „ ...	...	...	395 0 0	„
5	09	5 „ ...	...	...	395 0 0	„
5	45	5 „ ...	...	...	395 0 0	„
5	61	3 „ ...	9·50	35 0 0	332 8 0	
5	72	3 „ ...	9·50	35 0 0	332 8 0	
6	38	5 „ ...	12·00	60 0 0	720 0 0	
10	71	3 „ ...	9·50	35 0 0	332 8 0	
11	32	5 „ ...	...	...	395 0 0	„
12	13	5 „ ...	...	...	395 0 0	„
12	54	3 „ ...	9·50	35 0 0	332 8 0	
12	77	5 „ ...	...	...	395 0 0	„
13	42	5 „ ...	...	...	395 0 0	„
13	50	5 „ ...	...	...	395 0 0	„
13	72	5 „ ...	...	...	395 0 0	„
14	24	5 „ ...	...	...	395 0 0	„
14	59	5 „ ...	...	...	395 0 0	„
15	36	5 „ ...	11·00	60 0 0	660 0 0	
15	55	3 „ ...	10·50	35 0 0	367 8 0	
15	60	5 „ ...	11·00	60 0 0	660 0 0	
15	72	5 „ ...	11·00	60 0 0	660 0 0	
16	11	5 „ ...	14·00	60 0 0	840 0 0	
16	33	3 „ ...	10·50	35 0 0	367 8 0	
17	23	3 „ ...	10·50	35 0 0	367 8 0	
17	28	3 „ ...	11·50	35 0 0	402 8 0	
18	26	2 „ ...	...	...	190 0 0	„
18	38	3 „ ...	10·50	35 0 0	367 8 0	
18	51	3 „ ...	11·50	35 0 0	402 8 0	
18	73	3 „ ...	9·50	35 0 0	332 8 0	
19	18	5 „ ...	11·00	60 0 0	660 0 0	
19	28	3 „ ...	9·50	35 0 0	332 8 0	
19	41	5 „ ...	11·00	60 0 0	660 0 0	
19	57	5 „ ...	11·00	60 0 0	660 0 0	
19	78	5 „ ...	12·00	60 0 0	720 0 0	
20	28	3 „ ...	13·50	35 0 0	472 8 0	
20	69	2 „ ...	...	...	190 0 0	„
20	79	3 „ ...	10·50	35 0 0	367 8 0	
21	06	3 „ ...	9·50	35 0 0	332 8 0	
21	23	5 „ ...	10·00	60 0 0	600 0 0	
21	34	3 „ ...	9·50	35 0 0	332 8 0	
21	57	3 „ ...	9·50	35 0 0	332 8 0	
21	63	3 „ ...	9·50	35 0 0	332 8 0	
21	78	3 „ ...	9·50	35 0 0	332 8 0	
		Carried over...	...	...	19,940 0 0	

Quantities in Culverts—continued.

Mileage.		Openings.	Lineal yards.	Rate.			Amount.			Remarks.
Miles.	Chs.			Rs.	a.	p.	Rs.	a.	p.	
		Brought over.	...		...		19,940	0	0	
22	16	2 Feet ...	...		...		190	0	0	Open
22	29	3 „ ...	9·50	35	0	0	332	8	0	
22	48	3 „ ...	9·50	35	0	0	332	8	0	
22	79	3 „ ...	9·50	35	0	0	332	8	0	
23	17	3 „ ...	9·50	35	0	0	332	8	0	
23	44	3 „ ...	9·50	35	0	0	332	8	0	
24	25	3 „ ...	9·50	35	0	0	332	8	0	
25	00	5 „ ...	...		...		395	0	0	
26	11	2 „ ...	...		...		190	0	0	„
26	32	5 „ ...	...		...		395	0	0	„
27	29	3 „ ...	11·50	35	0	0	402	8	0	„
27	50	5 „ ...	11·00	60	0	0	660	0	0	
29	48	2 „ ...	...		...		190	0	0	„
30	11	2 „ ...	...		...		190	0	0	„
31	19	3 „ ...	9·50	35	0	0	332	8	0	
32	70	5 „ ...	...		...		395	0	0	„
37	10	5 „ ...	15·00	60	0	0	900	0	0	
37	22	5 „ ...	19·00	60	0	0	1,140	0	0	
37	30	2 „ ...	18·00	25	0	0	450	0	0	
37	32	2 „ ...	18·00	25	0	0	450	0	0	
39	00	2 „ ...	8·00	25	0	0	200	0	0	
39	07	2 „ ...	5·00	25	0	0	125	0	0	
39	42	5 „ ...	17·00	60	0	0	1,020	0	0	
39	58	5 „ ...	10·00	60	0	0	600	0	0	
39	72	2 „ ...	5·00	25	0	0	125	0	0	
43	27	3 „ ...	9·50	35	0	0	332	8	0	
45	16	3 „ ...	8·50	35	0	0	297	8	0	
45	24	3 „ ...	10·50	35	0	0	367	8	0	
45	40	3 „ ...	9·50	35	0	0	332	8	0	
47	28	5 „ ...	...		...		395	0	0	„
47	56	5 „ ...	...		...		395	0	0	„
47	77	5 „ ...	10·00	60	0	0	600	0	0	
48	42	3 „ ...	10·50	35	0	0	367	8	0	
							33,372	8	0	
5 Feet Culverts			210·00	60	0	0	12,600	0	0	
3 „ „			330·50	35	0	0	11,567	8	0	
2 „ „			54·00	25	0	0	1,350	0	0	
5 „ Open			17	395	0	0	6,715	0	0	
2 „ „			·6	190	0	0	1,140	0	0	
		Total.....	...		...		33,372	8	0	

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate of cost of one Level Crossing with Gate Lodge complete as per General Drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Rubble Masonry	56 C. yards.	10 0 0	560 0 0
Timber	11 C. feet.	4 8 0	49 8 0
Corrugated Iron in roof	6 Squares.	40 0 0	240 0 0
Earthwork in approaches 2-200′ × 18′ × 1′ ...	176 C. yards.	0 4 6	49 8 0
Broken Stone Metalling 2-200′ × 12′ × 6″ ...	90 „	1 8 0	135 0 0
Stone Gates Post including fixing	4 No.	26 0 0	104 0 0
Iron Gates 4 at 5 cwt. each	1 Ton.	350 0 0	350 0 0
Guard Rail 2·200lbs. say ·18	18 „	175 0 0	31 8 0
Fixing do.	2 No.	3 0 0	6 0 0
Carriage of Gates and Guard Rails Average lead 168 miles at 0-6-0 Rs. 63 per ton	1·18	63 0 0	74 5 0
2 Cattle-guard Frames Timber	64 C. feet.	5 0 0	320 0 0
Cost of one Level Crossing	...	...	1,919 13 0 say Rs. 1,920

Carwar to Gudduck 143½
Length of District 49 Miles $\frac{49}{2}$ = 24½ Average lead.

168

Estimate for Cattle Guard as per Type drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
4 Wooden Guard Frames	128 C. feet.	5 0 0	640 0 0
Stops for Carts	4 No.	1 8 0	6 0 0
2 Guard Rails (*See* Estimate for level crossings) including carriage			42 13 0
Fixing Guard Rails	2 „	3 0 0	6 0 0
Earthwork in approaches 2·200′ × 18′ × 1′...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2·200′ × 12′ × 6″	90 „	1 8 0	135 0 0
Total cost of Cattle Guard...	.....	.....	879 5 0 say Rs. 880

'CARWAR STATE RAILWAY

GUDDUK TO BELLARY.

District No. 1.

List of Level Crossings.

No.	Mileage.		Description.	Fencing.
	M.	Chs.		Lineal yards.
1	0	18	Level Crossing with Gate Lodge	440
2	0	57	Do. do. do.	484
3	1	18	Do. without do.	594
4	3	25	Do. do. do.	440
5	4	66	Do. do. do.	440
6	5	66	Do. do. do.	418
7	7	12	Do. do. do.	440
8	9	70	Do. with do.	440
9	10	61	Do. without do.	396
10	13	32	Do. do. do	308
11	18	68	Do. do. do.	572
12	19	32	Do. do. do.	418
13	21	16	Do. do. do.	440
14	22	52	Do. do. do.	396
15	24	76	Do. do. do.	396
16	25	61	Do. with do.	440
17	26	62	Do. without do.	440
18	27	76	Do. do. do.	440
19	28	37	Do. do. do.	440
20	30	5	Do. with do.	1,320
21	32	13	Do. without do.	440
22	33	48	Do. do. do.	440
23	34	16	Do. do. do.	440
24	34	50	Do. do. do.	440
25	35	0	Do. do. do.	440
26	35	23	Do. with do.	1,100
27	35	37	Do. without do.	638
28	35	77	Do. do. do.	440
29	36	30	Do. do. do.	440
30	37	0	Do. with do.	440
31	39	60	Do. do. do.	176
32	41	43	Do. without do.	440
33	42	40	Do. with do.	880
34	46	40	Do. without do.	440
35	47	53	Do. with do.	264
36	48	50	Do. do. do.	440
			Fencing Total Lineal yards.....	17,600

Summary.

11 Level Crossings with Gate Lodge.
25 Do. without do.
10 Miles Fencing.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No 1.

Estimate of cost of one mile of Fencing Material to be delivered in Carwar.

Description.	Materials required.
Straining Posts	10 No.
Screw Bases	587 „
Intermediate Posts	587 „
Wedges	587 „
Bolts for Straining Posts	100 „
Wire	40½ Cwt.

Total weight of Materials 13 *tons.*

Description.	Quantities.	Rates.	English.	Indian.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Straining Posts	10 No.	8 8 0	85 0 0	
Screw Bases...	587 „	1 0 0	587 0 0	
Intermediate Posts...	587 „	0 10 0	366 14 0	
Wedges	587 „	0 1 0	36 11 0	
Bolts for Straining Posts	100 „	0 5 0	31 4 0	
Wire	40½ Cwt.	13 0 0	526 8 0	
Carriage of Materials Average lead 168 miles, at 6 annas per ton per mile	13 Tons.	63 0 0	.....	819 0 0
Fixing Fencing	1,760 L. yds.	0 2 6	.....	275 0 0
Total...	.....	.....	1,633 5 0	1,094 0 0

Carwar to Gudduk ... ... 143½ Miles.
Length of District 49 miles $\frac{49}{2}$ ... 24½ „
Average lead ... ... 168 „

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate of cost of one mile of Permanent Way Materials delivered at Carwar.

Materials.	Weight.	Rate.	Amount.	
	Tons.	£ s. d.	£ s. d.	Rs. a. p.
Rails	67·37	12 12 6	850 11 0	
Fish plates	1·92	11 0 0	21 2 0	
Fish bolts and nuts	·74	20 10 0	15 3 0	
Fang bolts and washers	1·20	18 0 0	21 12 0	
Spikes	1·54	16 0 0	25 8 0	
Total...	72·77	...	933 16 0	
Freight to Carwar	72·77	3 10 0	254 14 0	
Insurance at 5 per cent.	...	...	46 14 0	
Landing Charges at 5 per cent.	...	...	46 14 0	
Loss of material at 5 per cent.	...	...	46 14 0	
Total...	...	...	1,328 12 0	13,286 0 0

Materials.	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward.....Rs.	13,286 0 0	.....
Carriage of 72·77 tons, 168 miles at 0-6-0 per ton per mile (143½ Carwar to Gudduk, 24½ mean lead from Gudduk to Toongabuddra)	.....	4,585 0 0
Teak Sleepers supplied from Carwar delivered 2,000 at Rs. 2 each	.....	4,000 0 0
Laying Permanent way at 0-8-0 per yard	.....	880 0 0
Total...	13,286 0 0	9,465 0 0

Total cost per Mile, Rs. 22,751.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No 1.

General Abstract of Quantities in Stations, &c.

	Excavation.	Excavation in Well.	Concrete.	Rubble.	Coursed Rubble.	Ashlar.	Rubble Arching.	Woodwork.	Panelled Doors and Windows.	Corrugated Iron Roofing.	Terrace Flooring.	Plastering.	Road Metalling.	Hard dry filling.	Flagging.	Doors of Sheds.	Earthwork in Sidings.	Ballast.	Iron Frame.
	C. yds.	C. yds.	C. yds.	C. yds.	C. yds.	C. ft.	C. yds.	C. ft.	Sq. ft.	Sqrs.	Sqrs.	Sqrs.	C. yds.	C. yds.	Sqrs.	Sq. ft.	C. yds.	C. yds.	
Hurlapur Station ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	B. 2,346	800	...
Platform	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	...	...	...
Station House (one unit).	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (four units)... ...	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tullacul Station ...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	B. 871	690	...
Platform, ...	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	...	...	...
Station House (one unit)..	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (four units) ...	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copal Station	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	B 2,171 C. 1,694	2,225	...
Platform, ...	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	...	...	...
Station House (three units.)	309	...	217	443	4	...	10	474	350	45·71	10	37·11	...	...	...	...	...	...	...
Tank (eight units) ...	40	..	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	·50	...	...	...	...
Latrines	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel Stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Goods Shed	214	...	123	452	8	...	19	...	...	35·00	...	...	...	...	14·50	660	...	...	13
Total ...	1,213	669	831	2,127	767	1,271	46	902	680	122·23	18	61·85	912	581	16·20	660	B. 5,388 C. 1,694	3,715	13

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Station Materials Required.

Materials.	Hurlapoor.	Tullacul.	Copal.	Total.	
Tanks (units)...	4	4	8	16	
Watercranes	1	1	1	3	
Semaphore Signals	1	1	1	3	
Distance Signals	2	2	2	6	
Weighbridges	...	...	1	1	
Switches (ordinary)	3	3	9	15	
Crossings	3	3	9	15	
Permanent way in sidings	·35	·35	·80	1·50	Miles.
Fencing	·80	·8	·90	2·50	Do.
Distance in miles from Gudduk	9½	26½	·34½		

Weight of Material.

Materials.	Hurlapoor.			Tullacul.			Copal.		
	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.
		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.
Tanks (units)	4	0·25	1·00	4	0·25	1·00	8	0·25	2·00
Watercranes	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00
Semaphore Signals	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50
Distance Signals...	2	0.50	1·00	2	0·50	1·00	2	0·50	1·00
Weighbridges	...	...	...	...	...	...	1	1·50	1·50
Switches (ordinary)	3	0·45	1·35	3	0·45	1·35	9	0·45	4·05
Crossings...	3	0·20	0·60	3	0·20	0·60	9	0·20	1·80
Permanent way	·35	72·77	25·47	·35	72·77	25·47	·80	72·77	58·20
Fencing	·80	13·00	10·40	·80	13·00	10·40	·90	13·00	11·70
Total.....	...	...	42·32	...	...	42·32	...	...	82·75

Total amount 167·39 Tons.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No 1.

Estimate of cost of Station Machinery for Hurlapoor.

Materials.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tank (units delivered in Carwar)...	4 No.	90 0 0	.....	.....
Watercranes	1 „	600 0 0	.....	600 0 0
Semaphore Signals...	1 „	160 0 0	.....	160 0 0
Distance Signals	2 „	180 0 0	.....	360 0 0
Switches (ordinary)	3 „	170 0 0	.....	510 0 0
Crossings	3 „	90 0 0	.....	270 0 0
Pump	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·35 Miles.	17,286 0 0	1,400 0 0	4,650 0 0
Fencing	·80 „	1,908 5 0	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	
Carriage from Carwar to Hurlapoor, 153 miles, at 6 annas per ton per mile	42·32 Tons	57 6 0	2,428 2 0	
Fixing point and crossings... ...	3 Sets.	30 0 0	90 0 0	
„ Station Machinery	4·50 Tons.	50 0 0	225 0 0	
Laying permanent way in sidings.	616 L. yds.	0 8 0	308 0 0	
Total...	.....	.....	4,991 2 0	9,216 10 0

Estimate of cost of Hurlapoor Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	240 C. yds.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar...	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows...	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earthwork in sidings	2,346 „	0 4 0	586 8 0
Ballasting	800 „	1 0 0	800 0 0
Total...	.....	.....	12,521 8 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,521 8 0	.....
Station materials	4,991 2 0	9,216 10 0
Total...	17,512 10 0	9,216 10 0

Total cost of Hurlapoor Station Rs. 26,729 4 0

CARWAR STATE RAILWAY.

GŬDDUK TO BELLARY.

District No. 1.

Estimate of cost of Station Machinery for Tullacul.

Materials.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Carwar)...	4 No.	90 0 0	.....	360 0 0
Watercranes (do. do.)...	1 „	600 0 0	.....	600 0 0
Semaphore Signals (do. do.)...	1 „	160 0 0	.....	160 0 0
Distance Signals (do. do.)...	2 „	180 0 0	.....	360 0 0
Switches (ordinary) (do. do.)...	3 „	170 0 0	.....	510 0 0
Crossings (do. do.)...	3 „	90 0 0	.....	270 0 0
Pump (do. do.)...	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·35 Miles.	17,286 0 0	1,400 0 0	4,650 0 0
Fencing	·80 „	1,908 5 0	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	.....
Carriage from Carwar to Tullacul, 170 miles, at 6 as. per ton per mile.	42·32 Tons.	63 12 0	2,697 14 0	.....
Fixing point and crossings ...	3 Sets.	30 0 0	90 0 0	.....
Do. Station Machinery ...	4·50 Tons.	50 0 0	225 0 0	.....
Laying permanent way in sidings ...	616 Lin. yds.	0 8 0	308 0 0	.....
Total ...	.....	.....	5,260 14 0	9,216 10 0

Estimate of cost of Tullacul Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations...	240 C. yds.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows	165 S. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earth work in sidings	871 „	0 4 0	217 12 0
Ballasting	690 „	1 0 0	690 0 0
Total ...	.....	.....	12,042 12 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,042 12 0	.....
Station materials	5,260 14 0	9,216 10 0
Total...	17,303 10 0	9,216 10 0

Total cost of Tullacul Station Rs. 26,520 4 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY

District No. 1.

Estimate of cost of Station Machinery for Copal.

Description.	Quantities.	Rate.	Amount.	
			Indian.	English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tank (units delivered in Carwar)	8 No.	90 0 0		720 0 0
Watercranes	1 „	600 0 0		600 0 0
Semaphore Signals ...	1 „	160 0 0		160 0 0
Distance Signals... ...	2 „	180 0 0		360 0 0
Weighbridges	1 „	900 0 0		900 0 0
Switches (ordinary) ...	9 „	170 0 0		1,530 0 0
Crossings...	9 „	90 0 0		810 0 0
Pump	1 „	1,000 0 0		1,000 0 0
Permanent way in sidings	·80 Miles.	17,286 0 0	3,200 0 0	10,629 0 0
Fencing.	·90 „	1,908 5 0	227 8 0	1,490 0 0
2 Cattle Guard Frames, Timber...	64 C. feet.	5 0 0	320 0 0	
Carriage from Carwar to Copal, 178 miles, at 6 as. per ton per mile... ...	82·75 Tons.	66 12 0	5,523 7 0	
Fixing point and crossings.	9 Sets.	30 0 0	270 0 0	
Do. station machinery...	·7 Tons.	50 0 0	350 0 0	
Laying permanent way in sidings	1,408 L. yds.	0 8 0	704 0 0	
Total...	.....	.....	10,594 15 0	18,199 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 1.

Estimate of cost of Copal Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundation	733 C. yards.	0 8 0	366 0 0
Do. to wells	223 „	2 0 0	446 0 0
Concrete	543 „	5 0 0	2,715 0 0
Rubble masonry	1,299 „	10 0 0	12,990 0 0
Coursed rubble	365 „	14 0 0	5,110 0 0
Ashlar	571 C. feet.	1 8 0	856 8 0
Rubble arching	37 C. yards.	16 0 0	592 0 0
Woodwork	512 C. feet.	4 8 0	2,304 0 0
Panelled doors and windows	350 S. feet.	1 8 0	525 0 0
Corrugated iron roofing	85·41 Squares.	40 0 0	3,416 6 0
Terrace flooring	10 „	15 0 0	150 0 0
Plastering	37·11 „	7 8 0	278 7 0
Road metalling	596 C. yards.	1 8 0	894 0 0
Hard dry filling	431 „	0 10 0	269 6 0
Earthwork in siding banks	2,171 „	0 4 0	542 12 0
Do. do. cuttings	1,694 „	0 4 0	423 8 0
Ballasting	2,225 „	1 0 0	2,225 0 0
Flagging	16·20 Squares.	50 0 0	810 0 0
Doors of Goods Shed	660 S. feet.	1 0 0	660 0 0
Iron Trusses 40 feet Spans 13 Spans (12 cwt. each	7·8 Tons.	290 0 0	2,262 0 0
Carriage of Iron Trusses from Carwar to Copal, 178 miles, at 6 annas per ton per mile ...	7·8 „	66 12 0	520 10 0
Total...	.....	.....	38,357 1 0

Total Cost.	Indian.	English.
	Rs. a. p.	Rs. a. p.
Station-house, &c.	38,357 1 0	
Station materials	10,594 15 0	18,199 0 0
Total...	48,952 0 0	18,199 0 0

Total cost of Copal Station, Rs. 67,151 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Way and Works for 42 miles 24 chains (for details see separate estimates).

Description.	Quantity.	Rate.	Per.	Amount. Indian.	Amount. English.
		Rs. a. p.		Rs. a. p.	£. s. p.
Earthwork including trimming of slopes as specified in line embankments...	494,684	0 4 6	C. yards ...	1,39,129 14 0	
Do. cuttings...	67,161	0 4 0	...	17,540 4 0	
Do. excavation to foundation of bridges	9,445	1 0 0	...	9,445 0 0	
Ballast for main line laid and trimmed	83,163	1 0 0	...	83,163 0 0	
Teak timber in bed plates and packings of bridges fixed in place inclusive of fastening	750	4 0 0	C. feet ...	3,000 0 0	
Wrought iron in plate girders ...	313¼	.....	Tons ...	.....	71,107 12 0
Fixing do. do. ...	313¼	40 0 0	Tons ...	12,530 0 0	
Carriage of bridge materials from Madras to Bellary, 1st class rate, 304 miles, at 2 annas per ton per mile	313¼	38 0 0	...	11,903 8 0	
Do. do. from Bellary, half way along line 20 miles, at 4 annas ...	313¼	5 0 0	...	1,566 4 0	
Permanent way in main line ...	42·175	13,286 0 0	Mile ...	.....	5,60,337 0 0
Carriage of permanent way	42·175	1,745 0 0	...	73,595 6 0	
Laying permanent way in main line as specified	74,228	0 8 0	Lin yards...	37,114 0 0	
Teakwood sleepers on main line exclusive of stations	84,350	2 8 0	Each ...	2,10,875 0 0	
Level crossings with gate lodge ...	7	1,875 0 0	...	13,125 0 0	
Do. without do. ...	20	875 0 0	...	17,500 0 0	
Fencing complete, exclusive of stations	10	2,220 5 0	Mile ..	5,870 0 0	16,333 2 0
Culverts (*see* list)	...	.....	...	31,617 8 0	
Rubble masonry in bridges	13,020	9 0 0	C. yard ...	1,17,180 0 0	
Ashlar in copings, caps, bed stones, and springers	13,129	1 8 0	C. feet ...	19,693 8 0	
Cost of Toongabudra bridge ...	...	.....	...	1,71,258 0 0	137,445 0 0
Pitching to bridges	495	3 0 0	S. yard ...	1,485 0 0	
Curtain walls for bridges	150	9 0 0	C. yard ...	1,350 0 0	
Land	500	100 0 0	Per acre.	50,000 0 0	
Do. irrigated	18	500 0 0	...	9,000 0 0	
Stations.					
Hospett	...	.....	...	46,474 10 0	18,178 13 0
Gadiganoor	...	.....	...	16,305 0 0	9,216 10 0
Kourtani	...	.....	...	16,385 8 0	9,216 10 0
Bellary	...	.....	...	1,16,084 9 0	85,975 1 0
Resident Engineer's house	1	12,000 0 0	Each ...	12,000 0 0	
Assistant Traffic Superintendent's house	1	8,000 0 0	...	8,000 0 0	
Permanent way Inspector's house ...	2	2,500 0 0	...	5,000 0 0	
Guards and Drivers...	12	2,000 0 0	...	24,000 0 0	
Electric Telegraph	42·30	1,000 0 0	Mile ...	14,805 0 0	27,495 0 0
Total ...	...	.....		12,96,995 15 0	9,35,305 0 0

Total Cost	22,32,300
Add for contingences 10 per cent. ...	2,23,230
„ for superintendence 10 per cent. ...	2,23,230
Rupees...	26,78,760

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT NO. 2.

Abstract of Quantities in Embankment.

Number.	Quantities.	Number.	Quantities.	Number.	Quantities.
		Brought over.	90,542	Brought over...	1,76,078
54 A	7,494	67	15,184	80	4,217
55	27,220	68	5,416	81	6,874
56	236	69	3,060	82	22,626
57	2,698	70	6,306	83	288
58	2,142	71	2,072	84	7,176
59	3,210	72	1,824	85	7,828
60	1,359	73	5,131	86	7,249
61	4,493	74	630	87	38,580
62	831	75	2,601	88	3,443
63	22,528	76	1,138	89	59,438
64	11,034	77	12,655	90	1,59,245
65	4,871	78	17,566	91	1,642
66	2,426	79	11,953		
Carried over.	90,542	Carried over.	1,76,078	Total C. yds...	4,94,684

Abstract of Quantities in Cutting.

		Brought over.	23,151	Brought over...	42,353
55	355	69	8,047	81	1,040
56	280	70	862	82	5,948
57	1,821	71	213	83	4,917
58	619	72	1,261	84	2,157
59	1,488	73	621	85	5,917
60	1,980	74	1,238	86	3,133
61	2,050	75	698	87	2,777
62	3,327	76	1,117	88	427
63	1,213	77	3,053	89	170
64	1,578	78	298	90	1,280
65	1,684	79	469	91	1,194
66	2,270	80	1,325		
67	3,881				
68	605				
Carried over.	23,151	Carried over.	42,353	Total C. yds...	71,313

CARWAR STATE RAILWAY.

DISTRICT No. 2.

TOONGABUDDRA RIVER TO BELLARY.

Quantities in Bridges.

Mileage.		Openings.	Foundations.	Rubble Masonry.	Ashlar.	Timber.	Amount.	Ironwork.	Amount.	Total Amount.	Remarks.	Depth of Bank.
M.	Chs.		C. yards.	C. yds.	C. feet.	C. feet.	Rs. a. p.	Tons.	Rs. a. p.	Rs. a. p.		Feet.
48	76	1 40	76	160	145	10	1,773 8 0	6·25	1,937 8 0	3,711 0 0		9
..	...	28 82	..	...	...	...	.....	...	.....	.....	See Special Estimate.	...
49	77	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0	Irrigation openings.	2
50	01	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		2
50	17	1 40	137	145	170	10	1,737 0 0	6·26	1,937 8 0	3,674 8 0		4
50	31	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		5
51	07	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		2
51	16	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		2
51	23	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		5
51	35	2 12	97	108	138	10	1,316 0 0	2·50	775 0 0	2,091 0 0		3
51	45	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		2
51	52	2 12	97	108	138	10	1,316 0 0	2·50	775 0 0	2,091 0 0		3
51	64	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		3
52	04	3 12	117	141	162	15	1,689 0 0	3·75	1,162 8 0	2,851 8 0		3
52	09	2 12	97	108	138	10	1,316 0 0	2·50	775 0 0	2,091 0 0		3
52	12	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		2
52	21	1 12	77	75	114	5	943 0 0	1·25	387 8 0	1,330 8 0		5
52	42	1 40	137	145	170	10	1,737 0 0	6·25	1,937 8 0	3,674 8 0		4
55	60	2 12	169	213	206	10	2,435 0 0	2·50	775 0 0	3,210 0 0		6
56	38	4 20	299	426	394	40	4,884 0 0	9·00	2,790 0 0	7,674 0 0		5
56	56	1 12	132	214	137	5	2,283 8 0	1·25	387 8 0	2,671 0 0		11
57	67	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
58	13	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		13
58	61	1 30	349	656	1,386	...	8,332 0 0	...	.....	8,332 0 0	Arch.	25
59	29	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
61	09	1 20	251	373	801	...	4,809 8 0	...	.....	4,809 8 0	Arch.	18
61	52	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
61	66	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
62	00	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
63	10	2 12	169	213	206	10	2,435 0 0	2·50	775 0 0	3,210 0 0		7
63	43	2 12	167	223	205	10	2,521 8 0	2·50	775 0 0	3,296 8 0		9
63	60	2 12	167	223	205	10	2,521 8 0	2·50	775 0 0	3,296 8 0		9
64	49	1 12	134	176	138	5	1,945 0 0	1·25	387 8 0	2,332 8 0		6
66	39	1 12	134	176	138	5	1,945 0 0	1·25	387 8 0	2,332 8 0		7
66	68	1 20	179	258	157	10	2,776 8 0	2·25	697 8 0	3,474 0 0		10
67	30	1 20	179	258	157	10	2,776 8 0	2·25	697 8 0	3,474 0 0		10
68	07	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		9
68	16	1 12	134	176	138	5	1,945 0 0	1·25	387 8 0	2,332 8 0		8
68	53	1 40	76	160	145	10	1,773 8 0	6·25	1,937 8 0	3,711 0 0		9
69	30	2 12	167	223	205	10	2,521 8 0	2·50	775 0 0	3,296 8 0		8
70	12	2 20	219	314	236	20	3,479 0 0	4·50	1,395 0 0	4,874 0 0		9
71	16	9 40	45	370	907	90	5,095 8 0	56·25	17,437 8 0	22,533 0 0		8
72	63	2 12	167	223	205	10	2,521 8 0	2·50	775 0 0	3,296 8 0		5
72	69	3 26	259	286	315	30	3,425 8 0	6·75	2,092 8 0	5,518 0 0		6
73	55	5 40	298	393	489	50	4,768 8 0	31·25	9,687 8 0	14,456 0 0		11
76	03	1 40	76	160	145	10	1,773 8 0	6·25	1,937 8 0	3,711 0 0		9
77	02	1 40	76	160	145	10	1,773 8 0	6·25	1,937 8 0	3,711 0 0		9
77	67	2 20	219	314	236	20	3,479 0 0	4·50	1,395 0 0	4,874 0 0		10
78	47	2 20	219	314	236	20	3,479 0 0	4·50	1,395 0 0	4,874 0 0		10
81	24	2 20	219	314	236	20	3,479 0 0	4·50	1,395 0 0	4,874 0 0		10
82	65	1 40	267	336	206	10	3,640 0 0	6·25	1,937 8 0	5,577 8 0		12
84	16	2 40	120	267	235	20	2,955 8 0	12·50	3,875 0 0	6,830 8 0		12
85	71	3 40	428	453	354	30	5,156 0 0	18·75	5,812 8 0	10,968 8 0		12
86	57	2 20	219	314	236	20	3,479 0 0	4·50	1,395 0 0	4,874 0 0		10
87	68	1 12	132	180	137	5	1,977 8 0	1·25	387 8 0	2,365 0 0		9
88	44	2 40	120	267	235	20	2,955 8 0	12·50	3,875 0 0	6,830 8 0		12
89	07	3 20	259	370	315	30	4,181 8 0	6·75	2,092 8 0	6,274 0 0		10
			9,445	13,020	13,129	750	1,49,318 8 0	313·25	97,107 8 0	2,46,426 0 0		

Schedule of Rates.	Rate. Rs. a. p.	Per.
Excavation to Foundations ...	1 0 0	C. yards.
Rubble Masonry	9 0 0	" "
Ashlar	1 8 0	C. feet.
Timber	4 0 0	" "
Ironwork	310 0 0	Ton.

Summary.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Excavation	9,445	1 0 0	9,445 0 0
Rubble Masonry	13,020	9 0 0	1,17,180 0 0
Ashlar	13,129	1 8 0	19,693 8 0
Timber	750	4 0 0	3,000 0 0
Ironwork	313¼	310 0 0	97,107 8 0
Total.....Rs.	.....	.....	2,46,426 0 0

2256. CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Details of Cost of Ironwork in Girders.

Cost per Ton.	English. £ s. d.	English. Rs. a. p.	Indian. Rs. a. p.
Cost in England	17 10 0		
Insurance at 5 per cent.	0 17 6		
Landing charges, &c., at 5 per cent.	0 17 6		
Freight to Madras	3 10 0		
	22 15 0	say 227 0 0	
Carriage by rail to Bellary, miles 304, at 2 annas, 3rd class rate for goods	.....	.....	38 0 0
Do. by road, average lead 20 miles, at 4 annas.	.....	.....	5 0 0
Fixing Girders	.....	.....	40 0 0
Total...	.....	227 0 0	83 0 0

Cost per Ton including Fixing Rs. 310.
Length of District 40 miles, $\frac{40}{2}$ =20 miles average lead by road.

Estimate of Cost of Toongabuddra Bridge—28 Spans of 82 Feet.

Description.	Quantities.	Rate. Rs. a. p.	Amount. Rs. a. p.
Coursed rubble	4,578 C. yards.	14 0 0	64,092 0 0
Block in course	26,961 C. feet...	1 0 0	26,961 0 0
Ashlar	3,866 „ ...	1 8 0	5,799 0 0
Timber	1,260 „ ...	4 0 0	5,040 0 0
Ironwork including Fixing	539 Tons ...	363 0 0	1,95,657 0 0
Add 2 Rs. per yard on masonry on account of foundations exclusive of Ashlar	5,577 ...	2 0 0	11,154 0 0
Total...	...	...	3,08,703 0 0

Details of Cost of Ironwork in Girders for Toongabuddra Bridge.

Cost per Ton.	English. £ s. d.	English. Rs. a. p.	Indian. Rs. a. p.
Cost in England	20 0 0		
Insurance at 5 per cent.	1 0 0		
Landing Charges at 5 per cent.	1 0 0		
Freight to Madras	3 10 0		
	25 10 0	Say 255 0 0	
Carriage by Rail to Bellary 3rd Class rate for 304 miles, at 2 annas per ton per mile...	...	...	38 0 0
Carriage by Road for 40 miles, at 4 annas per ton per mile	...	...	10 0 0
Fixing Girders per ton	...	...	60 0 0
Total...	...	255 0 0	108 0 0

Cost of Girders per ton Rs. 363.

CARWAR STATE RAILWAY.

TOONGABUDDRA RIVER TO BELLARY.

District No. 2.

Quantities in Culverts.

Mileage.		Openings.	Lineal Yards.	Rate.	Amount.	Remarks.
Miles.	Chains.			Rs. a. p.	Rs. a. p.	Irrigation.
49	53	5 Feet ...	...	...	510 0 0	„
49	58	5 „ ...	...	...	510 0 0	„
49	62	3 „ ...	...	...	460 0 0	„
49	64	3 „ ...	...	...	460 0 0	„
49	68	5 „ ...	...	...	510 0 0	„
49	73	5 „ ...	...	...	510 0 0	„
50	08	3 „ ...	...	...	460 0 0	„
50	19	5 „ ...	...	...	510 0 0	„
50	33	5 „ ...	...	...	510 0 0	„
50	35	5 „ ...	...	...	510 0 0	„
50	39	3 „ ...	...	...	460 0 0	„
50	42	5 „ ...	...	...	510 0 0	„
50	59	3 „ ...	...	...	460 0 0	„
50	61	3 „ ...	...	...	460 0 0	„
50	65	5 „ ...	...	...	510 0 0	„
50	69	5 „ ...	...	...	510 0 0	„
50	76	5 „ ...	...	...	510 0 0	„
51	00	5 „ ...	...	...	510 0 0	„
51	03	3 „ ...	...	...	460 0 0	„
51	09	5 „ ...	...	...	510 0 0	„
51	67	3 „ ...	...	...	460 0 0	„
51	77	3 „ ...	...	...	460 0 0	„
52	01	3 „ ...	...	...	460 0 0	„
52	06	5 „ ...	...	...	510 0 0	„
52	10	3 „ ...	...	...	460 0 0	„
52	30	5 „ ...	...	...	510 0 0	„
52	39	5 „ ...	...	...	510 0 0	„
52	78	3 „ ...	9·50	35 0 0	332 8 0	„
54	28	5 „ ...	...	...	395 0 0	Open.
54	72	3 „ ...	8·50	35 0 0	297 8 0	
55	41	3 „ ...	7·50	35 0 0	262 8 0	
55	51	2 „ ...	...	...	190 0 0	
55	69	2 „ ...	9·00	25 0 0	225 0 0	
59	65	5 „ ...	10·00	60 0 0	600 0 0	
64	35	5 „ ...	14·00	60 0 0	840 0 0	
65	41	5 „ ...	10·00	60 0 0	600 0 0	
66	10	3 „ ...	10·50	35 0 0	367 8 0	
66	15	3 „ ...	10·50	35 0 0	367 8 0	
66	22	3 „ ...	9·50	35 0 0	332 8 0	
66	24	3 „ ...	8·50	35 0 0	297 8 0	
66	27	3 „ ...	8·50	35 0 0	297 8 0	
66	43	3 „ ...	11·50	35 0 0	402 8 0	
67	43	5 „ ...	13·00	60 0 0	780 0 0	
67	45	5 „ ...	16·00	60 0 0	960 0 0	
68	41	3 „ ...	9·50	35 0 0	332 8 0	
		Carried over...			21,100 0 0	

Quantities in Culverts—continued.

Mileage.		Openings.	Lineal Yards.	Rate.	Amount.	Remarks.
Miles.	Chains.			Rs. a. p.	Rs. p. p.	
		Brought over.	...	...	21,100 0 0	
68	71	3 Feet ...	8·50	35 0 0	297 8 0	
69	58	5 „ ...	...	...	395 0 0	Open.
70	30	3 „ ...	8·50	35 0 0	297 8 0	
71	56	5 „ ...	11·00	60 0 0	660 0 0	
72	76	5 „ ...	...	...	395 0 0	„
72	78	5 „ ...	...	...	395 0 0	„
73	22	5 „ ...	10·00	60 0 0	600 0 0	
73	30	5 „ ...	10·00	60 0 0	600 0 0	
73	76	5 „ ...	11·00	60 0 0	660 0 0	
74	52	5 „ ...	...	...	395 0 0	„
75	71	5 „ ...	11·00	60 0 0	660 0 0	
76	44	2 „ ...	...	...	190 0 0	„
78	64	5 „ ...	...	...	395 0 0	„
80	01	2 „ ...	...	...	190 0 0	„
80	30	5 „ ...	10·00	60 0 0	600 0 0	
80	70	3 „ ...	9·50	35 0 0	332 8 0	
81	18	5 „ ...	11·00	60 0 0	660 0 0	
81	46	2 „ ...	...	...	190 0 0	„
81	74	5 „ ...	10·00	60 0 0	600 0 0	
82	20	2 „ ...	...	...	190 0 0	„
83	36	5 „ ...	12·00	60 0 0	720 0 0	
83	60	3 „ ...	10·50	35 0 0	367 8 0	
83	71	3 „ ...	9·50	35 0 0	332 8 0	
84	64	5 „ ...	...	...	395 0 0	„
				Total.....	31,617 8 0	
	16	Irrigation ...	Culverts.	5 Feet ...	at 510 0 0	8,160 0 0
	11	„ ...	„	3 Feet ...	„ 460 0 0	5,060 0 0
	140½	Lineal yards.	3 Ft. Culverts.	...	„ 35 0 0	4,917 8 0
	159	„ „	5 Ft. „	...	„ 60 0 0	9,540 0 0
	9	„ „	2 Ft. „	...	„ 25 0 0	225 0 0
	7	5 Feet open.	Culverts.	...	„ 395 0 0	2,765 0 0
	5	2 „ „	„	...	„ 190 0 0	950 0 0
						31,617 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of Cost of one Level Crossing with Gate Lodge complete as per general drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Rubble Masonry...	56 C. yards.	10 0 0	560 0 0
Timber	11 C. feet.	4 8 0	49 8 0
Corrugated iron in roof	6 squares.	40 0 0	240 0 0
Earthwork in approaches 2 × 200′ × 18′ × 1′ ...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2′ × 200 × 12′ × 6″ ...	90 „	1 8 0	135 0 0
Stone Gate Posts including Fixing	4 No.	26 0 0	104 0 0
Iron Gates 4 at 5 cwt. each	1 Ton.	350 0 0	350 0 0
Guard Rail 2 × 200 lbs. say—18 Tons... ...	18 „	175 0 0	31 8 0
Fixing ditto	2 No.	3 0 0	6 0 0
Carriage of Gates and Guard Rails			
By rail from Madras to Bellary...			
First Class rate, 304 miles at 0-1-0=19 Rs. ...	1·18 Tons.	19 0 0	22 7 0
Carriage by road, 20 miles, at 0-4-0= 5 Rs. ...	1·18 „	5 0 0	5 14 0
Two Cattle Guard Frames, timber	64 C. feet.	5 0 0	320 0 0
Total...	.....	.....	1,873 13 0 say Rs. 1,875

ength of District 40 Miles.

$\frac{40}{2}$ = 20 Average lead.

Estimate for Cattle Guard as per Type Drawing.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
4 Wooden Guard Frames	128 C. feet.	5 0 0	640 0 0
Stops for Carts	4 No.	1 8 0	6 0 0
2 Guard Rails (*See* Estimate for level crossings) including carriage	...	...	35 13 0
Fixing Guard Rails	2 „	3 0 0	6 0 0
Earthwork in approaches 2·200′ × 18′ × 1′ ...	176 C. yards.	0 4 6	49 8 0
Broken stone metalling 2·200′ × 12′ × 6′ ...	90 „	1 8 0	135 0 0
Total cost of Cattle Guard...	...	...	872 5 0 say Rs. 875

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

List of Level Crossings.

No.	Mileage.		Description.	Fencing.
	M.	Chs.		Lin. yds.
1	49	52	Level Crossing with Gate Lodge	5,280
2	50	13	Do. without do.	
3	50	75	Do. „ do.	
4	52	70	Do. „ do.	440
5	53	24	Do. with do.	440
6	54	60	Do. without do.	440
7	57	40	Do. with do.	880
8	60	13	Do. without do.	792
9	60	70	Do. „ do.	440
10	62	28	Do. „ do.	264
11	66	55	Do. „ do.	440
12	68	33	Do. „ do.	572
13	70	24	Do. „ do.	440
14	70	60	Do. „ do.	880
15	71	68	Do. with do.	792
16	74	03	Do, „ do.	440
17	74	53	Do. „ do.	264
18	76	27	Do. „ do.	1,100
19	77	23	Do. without do.	176
20	78	57	Do. „ do.	440
21	79	40	Do. „ do.	440
22	80	23	Do. „ do.	440
23	83	50	Do. „ do.	440
24	87	13	Do. „ do.	440
25	88	0	Do. „ do.	440
26	88	66	Do. „ do.	440
27	89	47	Do. „ do.	440
				17,600

Summary.

7 Level Crossings with Gate Lodge.
20 Do. without do.
10 Miles fencing.

Estimate of cost of one mile of Fencing Materials to be delivered in Madras.

Description.	Materials required.
Straining Posts	10 No.
Screw Bases	587 „
Intermediate Posts	587 „
Wedges	587 „
Bolts for Straining Posts	100 „
Wire	40½ Cwt.

Total weight of materials 13 Tons.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of one mile of Fencing Materials, &c.—continued.

Description.	Quantities.	Rate.	English.	Indian.
		Rs. a. p.	£. s. d.	Rs. a. p
Straining Posts	10 No.	8 8 0	85 0 0	.....
Screw Bases	587 „	1 0 0	587 0 0	.....
Intermediate Posts	587 „	0 10 0	366 14 0	.....
Wedges	587 „	0 1 0	36 11 0	.....
Bolts for Straining Posts	100 „	0 5 0	31 4 0	.....
Wire	40½ Cwt.	13 0 0	526 8 0	.....
Carriage from Madras to Bellary, 304 miles, 1st class goods, at 1 anna per ton per mile	13 Tons.	19 0 0	.....	247 0 0
Carriage from Bellary, average lead 20 miles, at 4 annas per ton per mile	13 „	5 0 0	.....	65 0 0
Fixing Fencing	1·760 Lin. yds.	0 2 6	.....	275 0 0
Total...	.....	.....	1,633 5 0	587 0 0

Estimate of cost of one mile of Permanent Way of both gauges, material to be delivered at Madras.

	Ton.	Rs.
Broad Gauge...	161·36	27,856
½ Narrow „	36·39	6,643
	197·75	34,499

	Amount.	
	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward...	34,499 0 0	.....
Carriage from Madras to Bellary of 197·75 tons, 1st class rate, at 1 anna per ton per mile, say Rs. 19	.....	3,757 0 0
Sleepers 1,760 at Rs. 5 each	.....	8,800 0 0
Laying permanent way, at 14 annas per yard	.....	1,540 0 0
Total...	34,499 0 0	14,097 0 0

Total cost per mile Rs. 48,596.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of one mile of Permanent Way. Materials to be delivered in Madras.

Description.	Weight.	Rate.	Amount.
	Tons.	£. s. d.	£. s. d.
Rails	67·37	12 12 6	850 11 0
Fishplates	1·92	11 0 0	21 2 0
Fishbolts and Nuts	·74	20 10 0	15 3 0
Fangbolts and Washers	1·20	18 0 0	21 12 0
Spikes	1·54	16 10 0	25 8 0
	72·77	...	933 16 0
Add—Freight	72·77	3 10 0	254 14 0
„ Insurance at 5 per cent.	...	...	46 14 0
„ Landing charges at 5 per cent.	...	...	46 14 0
„ Loss of Material at 5 per cent.	...	...	46 14 0
Total...	...	...	1,328 12 0
		or Rs...	13,286 0 0

Description.	English.	Indian.
	Rs. a. p.	Rs. a. p.
Brought forward...	13,286 0 0	
Carriage from Madras to Bellary, of 72·77 tons 304 miles 1st Class goods, at 1 anna per ton per mile, say Rs. 19 per ton...	...	1,382 0 0
Carriage from Bellary along line mean lead 20 miles, at 4 annas per ton per mile, say Rs. 5 per ton for the whole distance...	...	363 0 0
Sleepers 2,000 at Rs. 2 8 0 each.	...	5,000 0 0
Laying 8 annas per yard	...	880 0 0
Total...	13,286 0 0	7,625 0 0

Total cost per mile Rs. 20,911.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

General Abstract of Quantities in Station, &c.,

	Excavation to Foundations.	Excavation in Wells.	Concrete.	Rubble.	Coursed Rubble.	Ashlar.	Rubble Arching.	Woodwork.	Panelled Doors and Windows.	Corrugated Iron Roofing.	Terrace Flooring.	Plastering.	Road Metalling.	Hard Dry Filling.	Flagging.	Doors Shed.	Earthwork in Sidings	Ballast in Sidings.	Iron Trusses.
Hospett Station.																			
Platform, &c.	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	B. 4,033	2,349	...
Station house (3 units)	309	...	217	443	4	...	10	474	350	45·71	10	37·11	...	...	...	...	...	...	...
Tank (8 units)	40	...	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	0·50	...	...	...	...
Latrine	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Goods Shed...	214	...	123	4 2	8	...	19	...	...	35·00	...	...	...	...	14·50	660	...	...	13
Gadigangor Station.																			
Platform, &c.	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	B. 465	796	
Station house (1 unit)	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (4 units)	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well...	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kourtani Station.																			
Platform, &c.	97	...	...	195	...	350	...	...	...	...	...	...	158	75	...	...	1210	796	
Station house (1 unit)	123	...	97	219	4	...	4½	195	165	18·41	4	12·37	...	...	...	...	...	...	...
Tank (4 units)	20	...	47	...	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	223	...	...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bellary Station																	C. 5,400		
Platform, &c.	117	...	...	307	...	530	...	...	...	...	...	...	596	431	...	...	B. 17,100	9,487	
Station house (special drawing)	113	...	50	504	...	244	7	1,122	423	...	25·50	79·82	...	...	61·50	...	...	...	...
Tank (8 units)	40	...	188	...	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Well	...	335	...	...	105	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ashpit	31	...	15	...	35	...	8	23	...	...	...	...	...	...	0·50	...	...	...	...
Latrine	13	...	...	75	...	...	...	15	...	4·70	...	...	...	...	...	...	...	...	...
Fuel Stage	9	...	...	22	...	41	...	...	...	...	...	...	...	...	1·20	...	...	...	...
Fuel Shed	...	...	...	...	...	...	...	318	...	22·17	...	...	...	...	...	...	...	...	...
Goods Shed...	214	...	123	452	8	...	19	...	...	35·00	...	...	...	...	14·50	660	...	...	13
Engine Shed including Ashpit	348	...	229	364	142	...	42	...	...	40·00	...	...	...	...	...	...	...	...	10
Carriage Shed	317	...	190	364	...	...	42	...	...	40·00	...	...	...	...	...	...	...	...	10
Engine Turntable	217	...	87	100	...	80	...	...	...	...	...	...	...	...	5·00	...	...	...	...
Carriage Turntable...	50	...	26	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total...	2,682	1,004	1,739	4,326	1,305	2,166	164	2,380	1,103	264·10	43·50	141·67	1,508	1,012	98·90	1,320	28,208	13,428	46

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Station Materials.

Materials.	Hospett.	Gadiganoor.	Kourtani.	Bellary.	Total.
Tank (units)	8	4	4	8	24
Watercranes	1	1	1	1	4
Semaphore Signals	1	1	1	1	4
Distance Signals	2	2	2	2	8
Weighbridges	1	...	...	1	2
Switches (ordinary)	9	3	3	28	43
Crossings	9	3	3	28	43
Turntable Engine	...	...	...	1	1
„ Carriage	...	...	...	1	1
Permanent way in sidings	·80	·35	·35	Narrow 2·40 Double ·77 Broad ·27	4·94
Fencing	·90	·80	·80	1·00	3·50
Distance in miles from Bellary	38	22	12	...	...

Weights of Materials.

Materials.	Hospett.			Gadiganoor.			Kourtani.			Bellary.			
	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.	No.	Weight.	Total.	
		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.		Tons.	Tons.	
Tanks (units), ...	8	0·25	2·00	4	0·25	1·00	4	0·25	1·00	8	0·25	2·00	
Watercranes	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00	1	2·00	2·00	
Semaphore Signals	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50	1	0·50	0·50	
Distance Signals	2	0·50	1·00	2	0·50	1·00	2	0·50	1·00	2	0·50	1·00	
Weighbridges	1	1·50	1·50	...	...	...	...	...	...	1	1·50	1·50	
Switches ordinary	9	0·45	4·05	3	0·45	1·35	3	0·45	1·35	28	0·45	12·60	
Crossings	9	0·20	1·80	3	0·20	0·60	3	0·20	0·60	28	0·20	5·60	
Turntable Engine...	...	...	...	...	...	...	...	...	...	1	8.50	8·50	
„ Carriage	...	...	...	...	...	...	...	...	...	1	1·50	1·50	
Permanent way in sidings ...	·80	72·77	58·20	.35	72·77	25·47	·35	72·77	25·47	2·40	72·77	174·65	Narrow.
										·77	197·75	152·27	Double.
										·27	161·36	43·57	Broad.
Fencing	·90	13·00	11·70	·80	13·00,	10·40	·80	13·00	10·40	1·00	13·00	13·00	
Total.....	...	...	82·75	...	...	42·32	...	...	42·32	...	...	418·69	

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of Hospett Station.

Description.	Quantities.	Rate.			Amount.		
		Rs.	a.	p.	Rs.	a.	p.
Excavation to foundations	733 C. yds.	0	8	0	366	8	0
Do. to wells	223 „	2	0	0	446	0	0
Concrete	543 „	5	0	0	2,715	0	0
Rubble masonry	1,299 „	10	0	0	12,990	0	0
Coursed rubble	365 „	14	0	0	5,110	0	0
Ashlar	571 C. feet.	1	8	0	856	8	0
Rubble arching	37 C. yds.	16	0	0	592	0	0
Woodwork	512 C. feet.	4	8	0	2,304	0	0
Panelled doors and windows	350 Sq. feet.	1	8	0	525	0	0
Corrugated iron roofing	85·41 Squares.	40	0	0	3,416	6	0
Terrace flooring	10 „	15	0	0	150	0	0
Plastering	37·11 „	7	8	0	278	7	0
Road metalling	596 C. yds.	1	8	0	894	0	0
Hard dry filling	431 „	0	10	0	269	6	0
Earthwork in sidings	40·33 „	0	4	0	1,008	4	0
Ballasting	23·49 „	1	0	0	2,349	0	0
Flagging	16·20 Squares.	50	0	0	810	0	0
Doors of goodsshed	660 Sq. feet.	1	0	0	660	0	0
Iron trusses, 40 feet spans, 13 spans (12 cwt. each)	7·8 Tons.	290	0	0	2,262	0	0
Carriage of iron trusses from Madras to Bellary, 1st class goods, at 1 anna per ton per mile	7·8 „	19	0	0	148	3	0
Carriage from Bellary to Hospett, 38 miles, at 4 annas per ton per mile	7·8 „	9	8	0	74	2	0
Total.....	.....	.....			38,224	12	0

Total Cost.	Indian.			English.		
	Rs.	a.	p.	Rs.	a.	p.
Station-house, &c.	38,224	12	0	.....		
Station materials	8,249	14	0	18,178	13	0
Total.....	46,474	10	0	18,178	13	0

Total cost of Hospett Station Rs. 64,653-7-0.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY

District No. 2.

Estimate of cost of Station Machinery for Hospett.

Description.	Quantities.	Rate.	Amount.	
			Indian.	English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Madras).	8 No.	90 0 0	.....	720 0 0
Watercranes do.	1 „	600 0 0	.....	600 0 0
Semaphore Signals do.	1 „	160 0 0	.....	160 0 0
Distance Signals do.	2 „	180 0 0	.....	360 0 0
Weighbridges do.	1 „	900 0 0	.....	900 0 0
Switches (ordinary) do.	9 „	170 0 0	.....	1,530 0 0
Crossings do. do.	9 „	90 0 0	.....	810 0 0
Pumps do. do.	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in sidings ...	·80 Mile.	.....	4,000 0 0	10,628 13 0
Fencing	·90 „	.....	247 8 0	1,470 0 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	.....
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton per mile	82·75 Tons.	19 0 0	1,572 4 0	.....
Carriage from Bellary to Hospett, 38 miles, at 4 annas per ton per mile	82·75 „	9 8 0	786 2 0	.....
Fixing point and crossings ...	9 Sets.	30 0 0	270 0 0	.....
„ station machinery ...	7 Tons.	50 0 0	350 0 0	.....
Laying permanent way in sidings.	1,408 Lin. yds.	0 8 0	704 0 0	.....
Total.....	.....	.....	8,249 14 0	18,178 13 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Station Machinery for Gadiganoor.

Description.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Tanks (units delivered in Madras).	4 No.	90 0 0	...	360 0 0
Watercranes	1 „	600 0 0	...	600 0 0
Semaphore Signals	1 „	160 0 0	...	160 0 0
Distance Signals	2 „	180 0 0	...	360 0 0
Switches (ordinary)	3 „	170 0 0	...	510 0 0
Crossings	3 „	90 0 0	...	270 0 0
Pump	1 „	1,000 0 0	...	1,000 0 0
Permanent way in sidings ...	·35 Mile.	...	2,058 0 0	4,650 0 0
Fencing	·80 „	...	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber ...	64 C. feet.	5 0 0	320 0 0	
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton per mile	42·32 Tons.	19 0 0	804 0 0	
Carriage from Bellary to Gadiganoor 22 miles, at 4 annas per ton per mile	42·32 „	5 8 0	232 12 0	
Fixing point and crossings ...	3 Sets.	30 0 0	90 0 0	
„ station machinery	4·50 Tons.	50 0 0	225 0 0	
Laying permanent way in sidings.	616 Lin. yds.	0 8 0	308 0 0	
Total.....	...	...	4,257 12 0	9,216 10 0

Estimate of cost of Gadiganoor Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	240 C. yards.	0 8 0	120 0 0
„ to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yards.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and widows	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yards.	1 8 0	237 0 0
Hard dry filling	75 „	0 4 0	46 14 0
Earthwork in sidings	465 „	0 4 0	116 4 0
Ballasting	796 „	1 0 0	796 0 0
Total.....	...	...	12,047 4 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p.
Station-house, &c.	12,047 4 0	
Station materials	4,257 12 0	9,216 10 0
Total.....	16,305 0 0	9,216 10 0

Total Cost of Gadiganoor Station Rs. 25,521-10-0.

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT No. 2.

Estimate of cost of Kourtani Station.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to foundations	240 C. yds.	0 8 0	120 0 0
Do. to wells	223 „	2 0 0	446 0 0
Concrete	144 „	5 0 0	720 0 0
Rubble masonry	414 „	10 0 0	4,140 0 0
Coursed rubble	201 „	14 0 0	2,814 0 0
Ashlar	350 C. feet.	1 8 0	525 0 0
Rubble arching	4½ C. yds.	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled doors and windows	165 Sq. feet.	1 8 0	247 8 0
Corrugated iron roofing...	18·41 Squares.	40 0 0	736 6 0
Terrace flooring	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Road metalling	158 C. yds.	1 8 0	237 0 0
Hard dry filling	75 „	0 10 0	46 14 0
Earthwork in sidings	1,210 „	0 4 0	302 8 0
Ballasting	796 „	1 0 0	796 0 0
Total.....	...	...	12,233 8 0

Total Cost.	Indian. Rs. a. p.	English. Rs. a. p
Station-house, &c.	12,233 8 0	.....
Station materials	4,152 0 0	9,216 10 0
Total...	16,385 8 0	9,216 10 0

Total cost of Kourtani Station, Rs. 25,602 2 0

Estimate of cost of Station Machinery for Kourtani.

Description.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs. a. p
Tanks (units delivered in Madras.)	4 No.	90 0 0	.....	360 0 0
Watercranes	1 „	600 0 0	.....	600 0 0
Semaphore Signals	1 „	160 0 0	.....	160 0 0
Distance Signals	2 „	180 0 0	.....	360 0 0
Switches (ordinary)	3 „	170 0 0	.....	510 0 0
Crossings	3 „	90 0 0	.....	270 0 0
Pump	1 „	1,000 0 0	.....	1,000 0 0
Permanent way in Sidings ...	·35 Miles.	...	2,058 0 0	4,650 0 0
Fencing	·80 „	...	220 0 0	1,306 10 0
2 Cattle Guard Frames, Timber...	·64 C. feet.	5 0 0	320 0 0	.....
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna per ton, per mile... ...	42·32 Tons.	19 0 0	804 0 0	.....
Carriage from Bellary to Kourtani, 12 miles, at 4 annas per ton per mile	42·32 „	3 0 0	127 0 0	.....
Fixing points and crossings ...	3 Sets.	30 0 0	90 0 0	.....
„ station machinery	4·50 Tons.	50 0 0	225 0 0	.....
Laying permanent way in sidings.	616 Lin. yds	0 8 0	308 0 0	.....
Total.....	...	...	4,152 0 0	9,216 10 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

DISTRICT NO. 2.

Estimate of cost of Bellary Station.

Description.	Quantities.	Rate.			Amount.		
		Rs.	a.	p.	Rs.	a.	p.
Excavation to foundation	1,469 C. yards.	0	8	0	734	8	0
Do. to wells	335 „	2	0	0	670	0	0
Concrete	908 „	5	0	0	4,540	0	0
Rubble masonry...	2,199 „	10	0	0	21,990	0	0
Coursed rubble	538 „	14	0	0	7,532	0	0
Ashlar	895 C. feet.	1	8	0	1,342	8	0
Rubble arching	118 C. yards.	16	0	0	1,888	0	0
Woodwork	1,478 C. feet.	4	8	0	6,651	0	0
Panelled doors and windows	423 S. feet.	1	8	0	634	8	0
Corrugated iron roofing...	141·87 Squares.	40	0	0	5,674	12	0
Terrace flooring...	25·50 „	15	0	0	382	8	0
Plastering	79·82 „	7	8	0	598	10	0
Road metalling	596 C. yards.	1	8	0	894	0	0
Do. in diversion	880 „	1	8	0	1,320	0	0
Hard dry filling...	431 „	0	10	0	269	6	0
Earthwork in sidings bank	17,100 „	0	4	0	4,275	0	0
Do. do. cutting	5,400 „	0	4	0	1,350	0	0
Ballasting	9,487 „	1	0	0	9,487	0	0
Flagging...	82·70 Squares.	50	0	0	4,135	0	0
Doors of goods sheds	660 S. feet.	1	0	0	660	0	0
Iron trusses, 40 feet span, 33 spans, (12 cwt. each)	19·8 Tons.	290	0	0	5,742	0	0
Carriage of iron trusses, 1st class rate, 304 miles, at 1 anna	19·8 „	19	0	0	376	3	0
Total Rupees...	.....	...			81,146	15	0

Total Cost.	Indian.			English.		
	Rs.	a.	p.	Rs.	a.	p.
Station house, &c.	81,146	15	0			
do. materials	34,937	10	0	85,975	1	0
Total...	1,16,084	9	0	85,975	1	0

Total cost of Bellary Station, Rupees 2,02,059 10 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of Station Machinery for Bellary.

Description.	Quantities.	Rate.	Amount. Indian.	Amount. English.
		Rs. a. p.	Rs. a. p.	Rs a. p.
Tanks (units) delivered in Madras...	8 No.	90 0 0	...	720 0 0
Watercranes ,, ...	1 „	600 0 0	...	600 0 0
Semaphore Signal ,, ...	1 „	160 0 0	...	160 0 0
Distance Signals ,, ...	2 „	180 0 0	...	360 0 0
Weighbridges ,, ...	1 „	900 0 0	...	900 0 0
Switches (ordinary) ,, ...	28 „	170 0 0	...	4,760 0 0
Crossings ,, ...	28 „	90 0 0	...	2,520 0 0
Pump ,, ...	1 „	1,000 0 0	...	1,000 0 0
Engine Turntable ,, ...	...	...	...	6,000 0 0
Carriage Turntable ,, ...	..	...	...	1,350 0 0
Permanent way, Narrow Gauge ...	2·40 Miles.	...	12,000 0 0	31,886 6 0
,, Double „ ...	·77 „	...	6,776 0 0	26,564 4 0
„ Broad „ ...	·27 „	...	2,376 0 0	7,521 2 0
Fencing	1·00 „	...	275 0 0	1,633 5 0
Cattle Guard Frame, Timber ...	32 C. feet	5 0 0	160 0 0	
Carriage from Madras to Bellary, 1st class rate, 304 miles, at 1 anna, Rs. 19	418·69 Tons.	19 0 0	7,955 2 0	
Fixing points and crossings ...	28 Sets.	30 0 0	840 0 0	
,, station machinery ...	17 Tons.	50 0 0	850 0 0	
Laying permanent way	7,410 L. yds.	0 8 0	3,705 0 0	
Total.....	...	...	34,957 2 0	85,975 1 0

Estimate of cost of Junction Siding with the Madras Railway Company, Bellary Station, laid on both Gauge.

Description.	Quantities.	Rate.	Indian.	English.
		Rs. a. p.	Rs. a. p.	£ s. d.
Earthwork in line including trimming of slopes embankment ..	844 C. yds.	0 4 0	211 0 0	
,, cutting ...	4,559 „	0 4 0	1,139 12 0	
,, in Road and Nullah Diversion	3,000 „	0 4 0	750 0 0	
Ballast in line laid and trimmed ...	3,850 „	1 0 0	3,850 0 0	
Permanent way in junction line including carriage	·93 Mile.	...	13,057 3 0	32,084 0 0
3rd rail laid in Bellary Station ...	·42 „	...	2,759 13 0	2,790 0 0
One level crossing with gate lodge (complete)	1 No.	1,873 0 0	1,875 0 0	
Fencing complete including carriage and fixing	1·32 Miles.	2,155 5 0	699 0 0	2,156 0 0
Cost of 1-12 feet Girder (*See* drawing No. 21)	...	...	1,945 0 0	387 8 0
Cost of road culvert	...	...	967 0 0	
Total.....	...	...	27,253 12 0	37,417 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of cost of one mile of Permanent Way, Broad-Gauge Materials, to be delivered in Madras.

Materials.	Tons.	Rate.		
		£. s. d.	£. s. d.	
Rails	106·86	12 12 6	1,349 2 0	
Fish-plates	5·60	11 0 0	61 12 0	
Spikes and bolts ...	4·90	18 10 0	80 13 0	
Chairs	44·00	10 0 0	440 0 0	
Total...	161·36	...	1,931 7 0	Say Rupees 19,313.

	Amount.					
	English.			Indian.		
Brought forward Rs.....19,313	Rs.	a.	p.	Rs.	a.	p.
Freight at £ 3-10-0 per ton ... ... Rs. 5,648						
Insurance at 5 per cent. 965						
Landing charges at 5 per cent. 965						
Loss of Material at 5 per cent. 965	27,856	0	0			
Carriage from Madras to Bellary of 161·36 tons, 304 miles, 1st class Goods, at one anna per ton per mile, say Rs. 19 per ton...	.....			3,066	0	0
Sleepers 1,760 at Rs. 5 each.	.....			8,800	0	0
Laying permanent way at 8 annas per yard	.....			880	0	0
Total...	27,856	0	0	12,746	0	0

Total cost per mile Rs. 40,60[illegible]

Estimate of cost of Passenger Platform (one unit).

Description.	Quantities.	Rate.			Amount.		
		Rs.	a.	p.	Rs.	a.	p.
Excavation to Foundations	97 C. yards.	0	8	0	48	8	0
Rubble Masonry	195 „	10	0	0	1,950	0	0
Platform coping	350 C. feet.	1	8	0	525	0	0
Road metalling	158 C. yards.	1	8	0	237	0	0
Hard dry filling	75 „	0	10	0	46	14	0
Total...	.....	.....			2,807	6	0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

Estimate of cost of Station House (one unit).

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	123 C. yards.	0 8 0	61 8 0
Concrete	97 „	5 0 0	485 0 0
Rubble Masonry	219 „	10 0 0	2,190 0 0
Coursed Rubble for Semaphore...	4 „	14 0 0	56 0 0
Rubble Arching	4½ „	16 0 0	72 0 0
Woodwork	195 C. feet.	4 8 0	877 8 0
Panelled Doors and Windows	165 Sq. feet.	1 8 0	247 8 0
Corrugated Iron roofing 10 per cent. overlap ...	18·41 Squares.	40 0 0	736 6 0
Terrace Flooring...	4 „	15 0 0	60 0 0
Plastering	12·37 „	7 8 0	92 12 0
Total...	...	...	4,878 10 0

Estimate of cost of Tank (4 units).

Description.	Quantities.	Rate.	Amount.
			Rs. a. p.
Excavation to Foundation	20 C. yards.	0 8 0	10 0 0
Coursed Rubble	127 „	14 0 0	1,778 0 0
Concrete	47 „	5 0 0	235 0 0
Total...	.....	...	2,023 0 0

Estimate of Ashpit.

Description.	Quantities.	Rate.	Amount.
			Rs. a. p.
Excavation to Foundations	31 C. yards.	0 8 0	15 8 0
Coursed Rubble...	55 „	14 0 0	490 0 0
Invert	8 „	16 0 0	128 0 0
Concrete	15 „	5 0 0	75 0 0
Timber	23 C. Feet.	4 0 0	92 0 0
Flagging	0·50 Square.	50 0 0	25 0 0
Iron Bolts 2′ 2″ × 1¼″	16 No.	3 0 0	48 0 0
Total.....Rs.	.....	.....	873 8 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

District No. 2.

Estimate of Cost of Goods Shed.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	214 C. yards.	0 8 0	107 0 0
Concrete	123 „	5 0 0	615 0 0
Rubble Masonry	452 „	10 0 0	4,520 0 0
Coursed Rubble in Weighbridge	8 „	14 0 0	112 0 0
Rubble Arching	19 „	16 0 0	304 0 0
Corrugated Iron (10 per cent. per overlap) ...	35 Square.	40 0 0	1,400 0 0
Flagging	14·50 „	50 0 0	725 0 0
Timber in Doors	660 Sq. feet.	1 0 0	660 0 0
Total.....Rs.	.....	.....	8,443 0 0

Estimate of cost of Latrines.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	13 C. yards.	0 8 0	6 8 0
Rubble Masonry	75 „	10 0 0	750 0 0
Timber	15 C. feet.	4 8 0	67 8 0
Corrugated Iron, including 10 per cent. for overlap	4·70 squares.	40 0 0	188 0 0
Total Cost...	.....	.....	1,012 0 0

Estimate of cost of Fuel Stage.

Description.	Quantities.	Rate.	Amount.
		Rs. a. p.	Rs. a. p.
Excavation to Foundations	9 C. yards.	0 8 0	4 8 0
Rubble Masonry	22 „	10 0 0	220 0 0
Ashlar	41 C. feet.	1 8 0	61 8 0
Flagging	1·20 Square.	50 0 0	60 0 0
Total...	...	...	346 0 0

CARWAR STATE RAILWAY.

GUDDUK TO BELLARY.

Table of Gradients commences at Gudduk.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
0	0·00					2217·97
...	...	...	14·17	1 in 100		2227·32
...	14·17	...	29·00		Horizontal.	2227·32
...	29·00	...	54·11		1 in 100	2210·75
...	54·11	1	24·43		Horizontal.	2210·75
1	24·43	1	74·43	1 in 100		2243·75
1	74·43	2	5·59		Horizontal.	2243·75
2	5·59	2	51·32		1 in 100	2213·57
2	51·32	2	70·32		Horizontal.	2213·57
2	70·32	3	34·32	1 in 100		2242·61
3	34·32	3	45·32		Horizontal.	2242·61
3	45·32	4	15·82		1 in 100	2209·28
4	15·82	4	50·32		Horizontal.	2209·28
4	50·32	5	25·32	1 in 100		2245·58
5	25·32	5	31·32		Horizontal.	2245·58
5	31·32	5	63·32		1 in 300	2238·54
5	63·32	6	·32		Horizontal.	2238·54
6	·32	6	31·32		1 in 100	2218·08
6	31·32	6	47·32		Horizontal.	2218·08
6	47·32	6	58·32	1 in 100		2225·34
6	58·32	6	74·52		Horizontal.	2225·34
6	74·52	7	33·52		1 in 100	2199·60
7	33·52	7	44·32		Horizontal.	2199·60
7	44·32	8	12·32		1 in 210	2184·52
8	12·32	8	20·32		Horizontal.	2184·52
8	20·32	9	5·32		1 in 100	2141·62
9	5·32	9	31·45		Horizontal.	2141·62
9	31·45	10	12·45	1 in 230		2159·12
10	12·45	10	42·56		Horizontal.	2159·12
10	42·56	11	2·56	1 in 110		2183·12
11	2·56	11	9·56		Horizontal.	2183·12
11	9·56	11	37·56		1 in 276	2176·43
11	37·56	12	13·56		1 in 100	2139·47
12	13·56	12	70·56		Horizontal.	2139·47
12	70·56	13	14·56		1 in 100	2123·63
13	14·56	13	29·56		Horizontal.	2123·63
13	29·56	13	50·56	1 in 110		2136·23
13	50·56	13	57·99		Horizontal.	2136·23
13	57·99	14	4·56		1 in 260	2129·49
14	4·56	14	36·56		Horizontal.	2129·49
14	36·56	15	9·56		1 in 100	2094·51
15	9·56	15	32·56		Horizontal.	2094·51
15	32·56	16	0·56	1 in 500		2100·85
16	0·56	16	11·56		Horizontal.	2100·85
16	11·56	16	53·56		1 in 100	2073·13
16	53·56	16	75·56		Horizontal.	2073·13
16	75·56	17	13·56	1 in 110		2083·93
17	13·56	17	28·56		Horizontal.	2083·93
17	28·56	17	42·56		1 in 250	2080·23
17	42·56	17	60·56		Horizontal.	2080·23
17	60·56	17	74·56	1 in 160		2086·00
17	74·56	18	4·56		Horizontal.	2086·00

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datun in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
18	4·56	18	41·56		1 in 176	2072·13
18	41·56	19	51·56		1 in 400	2057·28
19	51·56	20	15·56		1 in 176	2046·78
20	15·56	20	65·56	Horizontal.		2040·78
20	65·56	21	75·56		1 in 1,000	2034·84
21	75·56	22	26·56	Horizontal.		2034·84
22	26·56	22	69·56		1 in 400	2027·75
22	69·56	23	34·56		1 in 1,100	2025·05
23	34·56	23	67·56		1 in 100	2003·27
23	67·56	24	5·56	Horizontal.		2003·27
24	5·56	24	25·56	1 in 150		2012·07
24	25·56	24	39·66	Horizontal.		2012·07
24	39·66	25	17·76		1 in 100	1973·72
25	17·76	25	37·76		1 in 150	1964·92
25	37·76	26	21·76		1 in 100	1922·68
26	21·76	26	44·76	Horizontal.		1922·68
26	44·76	26	62·21		1 in 100	1911·16
26	62·21	26	79·76	Horizontal.		1911·16
26	79·76	27	22·76		1 in 100	1895·98
27	22·76	27	54·43	Horizontal.		1895·98
27	54·43	28	1·76	1 in 400		1900·49
28	1·76	28	52·76		1 in 120	1872·44
28	52·76	29	0·76	1 in 434		1876·69
29	0·76	29	20·76		1 in 310	1872·43
29	20·76	29	46·76		1 in 100	1855·27
29	46·76	30	11·76		1 in 410	1848·03
30	11·76	30	52·21		1 in 100	1821·33
30	52·21	31	12·31	Horizontal.		1821·33
31	12·31	31	47·76.	1 in 100		1844·73
31	47·76	31	53·76	Horizontal.		1844·73
31	53·76	32	4·76		1 in 100	1824·27
32	4·76	32	27·76	1 in 253		1830·27
32	27·76	33	6·69		1 in 340	1818·83
33	6·69	33	49·15		1 in 100	1790·81
33	49·15	33	60·69	1 in 132		1796·58
33	60·69	33	72·69	Horizontal.		1796·58
33	72·69	34	8·89		1 in 132	1788·48
34	8·89	34	15·69	Horizontal.		1788·48
34	15·69	34	45·69	1 in 132		1803·48
34	45·69	34	65·69	Horizontal.		1803·48
34	65·69	35	37·23	1 in 100		1837·50
35	37·23	35	43·23	Horizontal.		1837·50
35	43·23	36	5·23	1 in 100		1865·22
36	5·23	36	39·23	1 in 160		1879·24
36	39·23	36	53·23	Horizontal.		1879·24
36	53·23	38	57·23		1 in 110	1780·84
38	57·23	38	79·23	1 in 300		1785·68
38	79·23	39	13·23	Horizontal.		1785·68
39	13·23	39	40·23		1 in 100	1767·86
39	40·23	39	45·23	Horizontal.		1767·86
39	45·23	39	63·23	1 in 100		1779·74
39	63·23	39	76·23	Horizontal.		1779·74
39	76·23	40	31·23		1 in 100	1756·64
40	31·23	40	47·23	Horizontal.		1756·64
40	47·23	40	65·23	1 in 100		1768·52
40	65·23	40	73·23	Horizontal.		1768·52
40	73·23	41	13·23		1 in 100	1755·32
41	13·23	41	47·23	Horizontal.		1755·32
41	47·23	42	70·23		1 in 110	1693·52
42	70·23	43	8·81	Horizontal.		1693·52

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
43	8·81	43	48·81		1 in 240	1682·52
43	48·81	43	66·51	Horizontal.		1682·52
43	66·51	44	4·51		1 in 400	1679·55
44	4·51	44	26·51		1 in 160	1670·48
44	26·51	44	49·51	Horizontal.		1670·48
44	49·51	44	71·51		1 in 160	1661·41
44	71·51	45	9·11	Horizontal,		1661·41
45	9·11	46	27·11		1 in 260	1636·53
46	27·11	47	6·11	1 in 300		1649·51
47	6·11	47	65·11		1 in 120	1617·06
47	65·11	47	74·51	Horizontal.		1617·06
47	74·51	48	28·51	1 in 200		1628·28
48	28·51	48	47·04	Horizontal.		1628·28
48	47·04	48	74·51		1 in 100	1610·15
48	74·51	49	47·21	Horizontal.		1610·15
49	47·21	49	56·21		1 in 100	1604·21
49	56·21	50	3·86	Horizontal.		1604·21
50	3·86	50	10·86	1 in 100		1608·83
50	10·86	50	22·86	Horizontal.		1608·83
50	22·86	50	27·86		1 in 200	1607·18
50	27·86	50	58·36	Horizontal.		1607·18
50	58·36	51	3·86	1 in 110		1622·48
51	3·86	51	6·86	Horizontal.		1622·48
51	6·86	51	15·86		1 in 100	1616·54
51	15·86	51	17·94	Horizontal.		1616·54
51	17·94	51	34·36	1 in 100		1627·38
51	34·36	51	46·36	1 in 600		1628·70
51	46·36	51	59·36		1 in 100	1620·12
51	59·36	51	66·36	Horizontal.		1620·12
51	66·36	52	5·36	1 in 100		1632·66
52	5·36	52	11·36	Horizontal.		1632·66
52	11·36	52	19·36		1 in 100	1627·38
52	19·36	52	23·36	Horizontal.		1627·38
52	23·36	52	42·36	1 in 100		1639·92
52	42·36	52	50·96	Horizontal.		1639·92
52	50·96	53	73·83	1 in 105		1704·58
53	73·83	54	43·83	Horizontal.		1704·58
54	43·83	55	54·18	1 in 132		1749·75
55	54·18	56	48·18	1 in 110		1794·15
56	48·18	57	73·18	1 in 132		1846·65
57	73·18	58	53·78	1 in 100		1886·65
58	53·78	59	45·78	1 in 230		1907·31
59	45·78	59	77·28	1 in 260		1915·30
59	77·28	60	26·78	1 in 110		1933·00
60	26·78	60	36·78	Horizontal.		1933·00
60	36·78	61	59·78		1 in 100	1865·02
61	59·78	62	22·78	1 in 350		1873·13
62	22·78	63	8·78		1 in 100	1829·57
63	8·78	63	33·78	Horizontal.		1829·57
63	33·78	64	7·78		1 in 450	1821·65
64	7·78	64	43·78		1 in 100	1797·89
64	43·78	64	53·78	Horizontal.		1797·89
64	53·78	65	21·78		1 in 100	1766·21
65	21·78	65	47·78	Horizontal.		1766·21
65	47·78	67	10·78		1 in 115	1695·62
67	10·78	67	31·78	Horizontal.		1695·62
67	31·78	68	67·38		1 in 380	1675·54
68	67·38	69	51·38		1 in 176	1651·54
69	51·38	70	43·38	Horizontal.		1651·54
70	43·38	70	63·38		1 in 100	1638·34

Table of Gradients—continued.

From		To		Gradients.		Height above Carwar. Datum in feet.
Miles.	Links.	Miles.	Links.	Ascending.	Descending.	
70	63·38	71	25·38	Horizontal.		1638·34
71	25·38	71	39·38		1 in 300	1635·26
71	39·38	72	2·18	Horizontal.		1635·26
72	2·18	72	54·18		1 in 170	1615·07
72	54·18	73	10·18	Horizontal.		1615·07
73	10·18	73	21·18		1 in 200	1611·44
73	21·18	73	34·18	Horizontal.		1611·44
73	34·18	73	52·18	1 in 200		1617·39
73	52·18	73	58·18	Horizontal.		1617·39
73	58·18	73	69·18		1 in 200	1613·76
73	69·18	74	25·18	Horizontal.		1613·76
74	25·18	74	43·18		1 in 300	1617·72
74	43·18	74	51·18	Horizontal.		1617·72
74	51·18	74	75·18		1 in 100	1601·88
74	75·18	75	35·18	1 in 132		1621·88
75	35·18	76	45·18		1 in 270	1599·88
76	45·18	77	13·14	Horizontal.		1599·88
77	13·14	77	60·14	1 in 180		1617·10
77	60·14	78	44·14	1 in 850		1622·07
78	44·14	78	58·14	Horizontal.		1622·07
78	58·14	79	72·14	1 in 150		1663·43
79	72·14	81	40·14		1 in 650	1650·43
81	40·14	81	74·14	1 in 270		1658·74
81	74·14	82	68·14		1 in 1,600	1655·69
82	68·14	83	16·14	1 in 900		1657·74
83	16·14	84	6·14		1 in 400	1646·19
84	6·14	84	18·14	Horizontal.		1646·19
84	18·14	84	36·14	1 in 300		1650·15
84	36·14	85	4·14		1 in 1,000	1646·98
85	4·14	85	34·94		1 in 150	1633·43
85	34·94	86	67·44		1 in 400	1614·87
86	67·44	87	7·44	1 in 220		1620·87
87	7·44	87	19·44	Horizontal.		1620·87
87	19·44	88	25·44		1 in 200	1592·49
88	25·44	88	79·39	Horizontal.		1592·49
88	79·39	89	23·39		1 in 200	1584·57
89	23·39	89	41·39	Horizontal.		1584·57
89	41·39	90	34·69	1 in 132		1621·22
90	34·69	91	26·19	Horizontal.		1621·22
91	26·19	92	7·19		1 in 100	1580·96
92	7·19	92	16·19	Horizontal.		1580·96

CARWAR STATE RAILWAY.

List of Bench Marks, Gudduk to Bellary.

No.	Description	Near.	Reduced.
		M. Chs.	Level.
	On S.W. corner of verandah of Hospital at Gudduk... ...	...	2233·97
	„ Revenue Survey Stone, S.L.	0 75	2211·12
	„ „ „ „ N.L.	2 26	2224·52
	„ „ „ „ S.L.	3 05	2220·47
	„ „ „ „ S.L.	3 72	2233·01
	„ „ „ „ S.L.	5 18	2239·85
	„ „ „ „ S.L.	6 40	2213·79
	„ Imlee Tree, S.L.	8 40	2169·02
	„ Revenue Survey Stone, S.L.	9 38	2141·89
	„ Babool Tree, S.L.	10 42	2158·61
	„ „ „ N.L.	12 42	2136·07
	„ „ „ O.L.	14 03	2128·88
	„ Revenue Survey Stone, S.L.	15 25	2086·90
	„ Babool Tree, N.L.	16 23	2093·58
	„ „ „ S.L.	17 25	2078·88
	„ „ „ S.L.	18 25	2072·52
	„ Revenue Survey Stone, N.L.	19 62	2055·88
	„ „ „ „ N.L.	21 10	2044·16
	„ Stone Near Tank, N.L.	22 03	2037·10
	„ Shabhoo Tree, S.L.	23 38	2020·66
	„ Revenue Survey Stone, N.L.	25 23	1968·50
	„ Babool Tree, S.L.	26 77	1907·69
	„ Leem Tree, S.L.	28 03	1898·03
	„ „ „ N.L.	29 27	1869·76
	„ Small White Temple (P)	30 00	1851·95
	„ Revenue Survey Stone, S.L.	31 36	1839·65
	„ „ „ „ S.L.	32 78	1822·65
	„ Babool Tree, S.L	34 00	1787·50
	„ N. E. corner of Kutcherry at Copal (P)	35 13	1829·31
	„ Rock, S.L.	36 25	1875·04
	„ Stone, S.L....	37 03	1860·17
	„ Rock, S.L.	38 70	1786·00
	„ Rock near Tree, N.L.	40 04	1764·82
	„ Rock, S.L.	41 44	1753·91
	„ N. W. corner of Plinth of Temple (Kunkapoor) (P) ...	42 40	1702·59
	„ Rock, S.L.	44 00	1673·74
	„ „ N.L.	45 30	1658·11
	„ „ N.L.	46 43	1637·29
	„ „ near Tree, S.L.	48 03	1617·27
	„ S. E. corner of Temple near Hooligi (P)...	49 10	1597·08
	„ Stone, S.L.	50 17	1613·02
	„ Tree, S.L.	51 09	1622·40
	„ „ S.L.	52 00	1634·73
	„ Largest Stone in row, S.L...	53 48	1692·63
	„ Stone in bush, N.L.	54 48	1707·89
	„ Nearest Stone in row, S.L.	56 31	1783·98
	„ Stone, N.L...	61 28	1793·75
	„ „ S.L.	62 30	1875·70
	„ Stone in Nullah N.L.	63 44	1819·50
	„ Rock, N.L.	64 48	1800·61
	„ Stone, foot of Telegraph Post, S.L...	66 00	1748·25
	„ Granite rock, N.L....	67 00	1695·55
	„ Small Stone on L.	69 31	1655·63
	„ Rock, S.L.	70 75	1639·70

List of Bench Marks, Gudduk to Bellary—continued.

No.	Description.	Near.		Reduced.
		M.	Chs.	Level.
	On Station peg, S.L.	71	60	1631·41
	„ „ „ S.L.	73	10	1613·79
	„ Stone, S.L.	74	06	1620·29
	„ Babool Tree, N.L.	77	60	1612·85
	„ Stone S.L.	78	63	1622·92
	„ „ S.L.	80	24	1659·21
	„ „ N.L.	81	22	1647·43
	„ „ S.L.	82	62	1653·73
	„ „ N.L.	85	20	1642·38
	„ „ N.L.	86	52	1611·55
	„ „ N.L.	88	13	1591·15
	„ „ N.L.	89	05	1589·09
	„ „ N.L.	90	02	1601·86
	„ Corner of Mainwaring Tank at Bellary	...		1586·49

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